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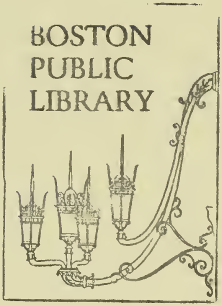

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SECTION 02700 - SANITARY AND STORM SEWERAGE SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes sanitary sewerage and storm sewerage system piping and appurtenances from a point 10 feet outside the building to the point of disposal.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 02200, "Earthwork", for excavation and backfill required for storm sewerage system piping and structures.
2. Section 15400, "Plumbing", for building sanitary sewerage piping and storm drains.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for drainage piping specialties.

C. Shop drawings for precast concrete sanitary sewerage manholes and storm drainage manholes and catch basins, including frames, covers, and grates.

D. Coordination profile drawings showing system piping in elevation. Draw profiles at a horizontal scale of not less than 1 inch equals 40 feet and a vertical scale of not less than 1 inch equals 4 feet. Indicate pipe and underground structures. Show types, sizes, materials, and elevations of other utilities crossing sewerage system piping.

1.4 QUALITY ASSURANCE:

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary and storm sewerage systems.

B. Utility Compliance: Comply with Boston Water and Sewer Commission regulations and standards pertaining to installation and connection of sanitary and storm sewerage systems.

1.5 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary and storm sewerage system piping may be installed in compliance with original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate connection to public sewers with the Boston Water and Sewer Commission.

B. Coordinate with interior building sanitary sewer and storm drainage piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are not limited to the following:

1. Cleanouts:
   a. Ancon, Inc.
   b. Josam Co.
   c. Smith (Jay R.) Mfg. Co.
   d. Wade Div.; Tyler Pipe.
   e. Zurn Industries, Inc.; Hydromechanics Div.
2. Trench Drain System:
   a. ACO Polymer Products, Inc.
   b. Innovative Plastic Products, Inc.
   c. PolyDrain, Inc.
3. Underground Warning Tapes:
   a. Allen Systems, Inc.; Reef Industries, Inc.
   b. Brady (W.H.) Co.; Signmark Div.

   c. Calpico, Inc.
   d. Carlton Industries, Inc.
   e. EMED Co., Inc.
   f. Seton Name Plate Co.

2.2 PIPE AND FITTINGS:

A. General: Provide pipe and pipe fitting materials compatible with each other.

B. Hub and Spigot Cast-Iron Soil Pipe and Fittings: ASTM A 74, gray cast iron, for compression gasket joints.

   1. Class: Service.
   2. Gaskets: ASTM C 564, rubber, thickness to match class of pipe.

C. PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for solvent cement or elastomeric gasket joints.

   1. Solvent Cement: ASTM D 2564.
   2. Gaskets: ASTM F 477, elastomeric seal.

D. Couplings: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.

   1. Gaskets: ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Gaskets for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

2.3 SANITARY AND STORM SEWERAGE MANHOLES:

A. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated with provision for rubber gasket joints.

   1. Base Section: 6-inch minimum thickness for floor slab and walls and base riser section, and having a separate base slab or base section with integral floor.
   2. Riser Sections: 6-inch minimum thickness; 60-inch diameter, and lengths to provide depth indicated.
   3. Top Section: Eccentric cone type, unless flat-slab-top type is indicated. Top of cone to match grade rings.
   4. Grade Rings: Provide 2 or 3 reinforced concrete rings or courses of sewer brick, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.
   5. Gaskets: ASTM C 443, rubber.
   6. Steps: Cast into base, riser, and top sections sidewall

at 12-to 16-inch intervals.

7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete.

B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, heavy-duty, ductile iron, 24-inch inside diameter by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover, indented top design, with lettering "SANITARY SEWER" or "STORM SEWER", as appropriate, cast into cover.

C. Manhole Steps: Wide enough for an adult to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Ductile iron or cast aluminum.

2.4 CLEANOUTS:

A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.

2.5 CATCH BASINS:

A. Precast Concrete Catch Basins: ASTM C 478 or ASTM C 858, precast reinforced concrete, of depth indicated with provision for rubber gasket joints.

1. Base Section: 6-inch minimum thickness for floor slab and walls and base riser section with integral floor.
2. Riser Sections: 6-inch minimum thickness; 60-inch diameter, and lengths to provide depth indicated.
3. Top Section: Eccentric cone type, unless flat-slab-top type is indicated. Top of cone to match grade rings.
4. Grade Rings: Provide 2 or 3 reinforced concrete rings or courses of sewer brick, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.
5. Gaskets: ASTM C 443, rubber.
6. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-inch intervals.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete.

B. Catch Basin Frames and Grates: ASTM A 536 Grade 60-40-18, heavy-duty, ductile iron, 24-inch square inside dimension by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch square flat grate having square drainage openings.

C. Catch Basin Steps: Wide enough for an adult to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Ductile iron or cast aluminum.

2.6 TRENCH DRAIN SYSTEM:

A. General: Provide modular channel trench drain system of channels, grates, and accessories, as indicated.

B. Channels: Interlocking precast polymer concrete modular units, 6 inches wide, with built-in slope of 0.6 percent, and rounded inside bottom surface.

C. Grates: Ductile iron, medium duty, designed to set in channel top recess without rocking or rattling. Provide units with set screws for non-removable attachment to frame.

D. Accessories: Catch basins, channel caps, and other accessories of same material as channels, as indicated.

2.7 AREA DRAINS:

A. General: Provide modular drain assembly consisting of nominal 9 inch square grate, square sump basin with transition to 6 inch diameter outlet drain pipe, including all accessories.

B. Sump basin: Ductile iron or non-ferrous metal, with sump transitioning from square grate to round outlet. Fabricate with flange for fitting into drain pipe and recess to receive grate.

C. Grates: Light duty ductile iron or brass designed to fit into sump basin without lifting. Equip with fasteners to secure in place.

2.8 CONCRETE AND REINFORCEMENT:

A. Concrete: Portland cement mix, 3,000 psi.

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

2.9 IDENTIFICATION:

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED STORM SEWERAGE SYSTEMS:

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 PIPE APPLICATIONS FOR UNDERGROUND SEWERS:

A. Pipe Sizes 10 inches and Smaller: PVC gasket joint sewer pipe and fittings.

B. Pipe laid under Structure: Service-class hub and spigot cast-iron soil pipe and fittings.

3.3 INSTALLATION, GENERAL:

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary and storm sewerage system piping. Install the piping as indicated, to the extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes or catch basins for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope of 1 percent for storm sewerage systems and 2 percent for sanitary sewerage systems, except where indicated otherwise.

F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.

G. Extend storm sewerage system piping to connect to building storm drains, of sizes and in locations indicated.

3.4 PIPE AND TUBE JOINT CONSTRUCTION AND INSTALLATION:

A. Join and install hub and spigot cast-iron soil pipe and fittings, with compression gaskets in accordance with CISPI "Cast Iron Soil Pipe and Fittings Handbook, Volume I." Use "Service" class gaskets to match class of pipe and fittings.

B. Join and install PVC pipe as follows:

1. Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212.
2. Installation in accordance with ASTM D 2321.

C. Join different types of pipe with standard manufactured couplings and fittings intended for that purpose.

3.5 MANHOLES:

A. General: Install manholes complete with accessories as indicated. Form continuous concrete or split pipe section channel and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 1 inch above finish surface, unless otherwise indicated.

B. Place precast concrete manhole sections as indicated, and install in accordance with ASTM C 891.

C. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.

3.6 CLEANOUTS:

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.7 CATCH BASINS:

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.8 AREA DRAINS:

A. Install area drain assemblies and drop from sewer pipe to drain sump as indicated. Embed drain sump pan in concrete 8 inches deep. Set top of drain 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.9 TRENCH DRAIN SYSTEM:

A. Install trench drains as indicated and in accordance with the manufacturer's installation instructions.

B. Embed channels in minimum of 4 inches depth of concrete around bottom and sides.

3.10 CONNECTIONS TO CITY SEWER:

A. Comply with Boston Water and Sewer Commision requirements for connections to existing sanitary sewer and storm drain.

B. Make branch connections from side into existing underground manholes by cutting opening into existing unit sufficiently large to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Provide concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.11 CLOSING ABANDONED SEWERAGE SYSTEMS:

A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with not less than 8-inch-thick concrete, or as required by local authorities.

B. Abandoned Structures: Remove structure and close open ends of the remaining piping. Fill with approved backfill.

3.12 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.13 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
2. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct

such defects and reinspect.

END OF SECTION 02700

SECTION 02831 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Galvanized steel chain link fence and gates.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data and installation instructions for fence and gate posts, fabric, gates, and accessories.
2. Shop drawings showing location of fence, gates, each post, and details of post installation, gate swing, hardware, and accessories.

PART 2 - PRODUCTS

2.1 FABRIC:

A. Selvage: Knuckled at one selvage and twisted at the other.

B. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 12 feet high. Wire size includes zinc or aluminum coating.

1. Size: 2-inch mesh, 11-gage (0.120-inch diameter) wire.
2. Galvanized Steel Finish: ASTM A 392, Class 1, with not less than 1.2 oz. zinc per sq. ft. of uncoated wire surface.

C. Slats: Standard plastic slats for intertwining in fabric mesh to provide visual screening.

2.2 FRAMING:

A. Strength requirements for posts and rails conforming to ASTM F 669.

B. Steel Framework, General: Posts, rails, braces, and gate frames; Type I Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (schedule 40).

C. End, corner, and pull posts: 2.375-inch OD Type I steel pipe.

D. Line or intermediate posts: 1.90-inch OD Type I steel pipe.

E. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

1. Up to 6 feet: 2.875-inch OD Type I steel pipe.

F. Top Rail: Manufacturer's longest lengths, with expansion-type couplings, approximately 6 inches long, for each joint. Provide means for attaching top rail securely to each gate corner, pull, and end post.

1. Galvanized Steel: 1-1/4-inch NPS (1.66-inch OD) Type I steel pipe.

2.3 FITTINGS AND ACCESSORIES:

A. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel, to suit manufacturer's standards.

1. Zinc Coating: Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights per Table I.

B. Tie Wires: 12-gage (0.106-inch diameter) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating of surface area in accordance with ASTM A 641, Class 3.

C. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at midheight of fabric. Use same material as top rail for brace, and truss to line posts with 3/8-inch- diameter rod and adjustable tightener. Provide manufacturers standard galvanized steel or cast iron or cast aluminum cap for each end.

D. Bottom Rail: Same material as top rail. Provide manufacturer's standard galvanized steel or cast iron or cast aluminum cap for each end.

E. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive top rail.

F. Tension or Stretcher Bars: Hot-dip galvanized steel with minimum length 2 inches less than full height of fabric, minimum cross-section of 3/16 inch by 3/4 inch. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.

G. Tension and Brace Bands: Minimum 3/4-inch-wide hot-dip galvanized steel.

H. Post Anchors: Manufacturer's standard sleeves and anchors for setting posts in concrete work.

   1. Coordinate placement of sleeves in concrete, if required.

2.4 GATES:

A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories.

   1. Provide same fabric as for fence unless otherwise indicated. Install fabric with tension bars and bands at vertical edges and at top and bottom edges.
   2. Install diagonal cross-bracing consisting of 3/8-inch-diameter adjustable-length truss rods on gates to ensure frame rigidity without sag or twist.

B. Swing Gates: Comply with ASTM F 900.

   1. Fabricate perimeter frames of minimum 1.660-inch OD Type I steel pipe or 1.50-inch square galvanized steel tubing.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install fence in compliance with ASTM F 567.

B. Setting Posts: Coordinate post anchor sleeve placement with concrete work if required by type of anchor used.

   1. Space maximum 10 feet o.c., unless otherwise indicated.

2. Set each post plumb, true, and in vertical and top alignment, and hold in position during placement and finishing operations.

C. Top and Bottom Rails: Run top rail continuously through line post caps, at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

D. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

E. Fabric: Leave approximately 1-1/2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires.

1. Install plastic slats to provide visual screening.

F. Tension or Stretcher Bars: Thread through or clamp to fabric 4 inches o.c., and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c.

G. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.

1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.

H. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

I. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

END OF SECTION 02831

SECTION 02900 - LANDSCAPE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes provisions for the following items:

1. Trees, shrubs, plants, and ground cover.
2. Top soil and soil amendments.
3. Initial maintenance of landscape materials.

B. Extent of planting required is indicated and scheduled on landscape drawings.

1.3 QUALITY ASSURANCE:

A. Subcontract landscape work to a single firm specializing in landscape work.

B. Source Quality Control:

1. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
2. Do not make substitutions. If specified landscape material is not obtainable, submit proposal for use of equivalent material.
3. Topsoil: Before delivery of topsoil, furnish Architect with written statement giving location of properties from which topsoil is to be obtained.
4. Trees, Shrubs and Plants: Comply with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice.
5. Label each tree and shrub with securely attached waterproof tag bearing legible designation of botanical and common name.
6. Inspection: The Architect may inspect trees and shrubs at site before planting for compliance with requirements for genus, species, variety, size, and quality. Architect retains right to further inspect trees and

shrubs and to reject unsatisfactory or defective material at any time during progress of work.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Plant and Material Certifications:

1. Certificates of inspection as required by governmental authorities.
2. Manufacturer's or vendor's certified analysis for soil amendments and fertilizer materials.
3. Label data substantiating that plants, trees, shrubs and planting materials comply with specified requirements.

C. Maintenance Instructions: Typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.5 DELIVERY, STORAGE AND HANDLING:

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Trees and Shrubs: Provide freshly dug trees and shrubs. Do not prune prior to delivery unless otherwise approved by Architect. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches, or destroy natural shape. Provide protective covering during delivery. Do not drop balled and burlapped stock during delivery.

C. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade and keep roots moist by covering with mulch, burlap or other means of retaining moisture.

D. Do not remove container-grown stock from containers until planting time.

1.6 SEQUENCING AND SCHEDULING:

A. Planting Time: Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work.

1.7 SPECIAL PROJECT WARRANTY:

A. Warranty trees and shrubs, for a period of one year after date of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Installer's control.

B. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period.

PART 2 - PRODUCTS

2.1 TOPSOIL:

A. Topsoil for landscape work is not available at site and must be furnished as specified.

B. Provide new topsoil that is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1/2 inch in any dimension, and other extraneous or toxic matter harmful to plant growth.

   1. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4 inches.

2.2 SOIL AMENDMENTS:

A. Lime: Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.

   1. Add lime to planting and topsoil to adjust soil pH range as recommended by nursery for each type of plant specie.

B. Peat Humus: Finely divided peat, so completely decomposed and free of fibers that its biological identity is lost. Provide in granular form, free of hard lumps and with pH range suitable for intended use.

C. Bonemeal: Commercial, raw, finely ground; 4 percent nitrogen and 20 percent phosphoric acid.

D. Superphosphate: Soluble mixture of treated minerals; 20

percent available phosphoric acid.

E. Manure: Well rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials and containing no chemicals or ingredients harmful to plants.

F. Mulch: Organic mulch free from deleterious materials and suitable for top dressing of trees, shrubs, or plants and consisting of ground or shredded bark.

G. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

1. Fertilizer with not less than 5 percent total nitrogen, 10 percent available phosphoric acid and 5 percent soluble potash.

2.3 PLANT MATERIALS:

A. Quality: Provide trees, shrubs, and other plants of size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".

B. Deciduous Trees: Provide balled and burlapped (B&B) trees of caliper scheduled and with branching recommended by ANSI Z60.1 for type and species required.

C. Deciduous Shrubs: Provide shrubs of the height scheduled and with not less than minimum number of canes required by ANSI Z60.1 for type and height of shrub required.

1. Provide balled and burlapped (B&B) deciduous shrubs.

2. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to specified limitations for container grown stock.

2.4 GROUND COVER:

A. Provide plants established and well rooted in removable containers or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the pot size shown or listed.

2.5 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Filtration/Separation Fabric: Water permeable filtration fabric of fiberglass or polypropylene fabric.

B. Wrapping: Tree-wrap tape not less than 4 inches wide, designed to prevent borer damage and winter freezing.

C. Stakes and Guys: Provide stakes of sound new hardwood, treated softwood, or redwood, free of knot holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire, not lighter than 12 ga. Provide not less than 1/2 inch diameter rubber or plastic hose, cut to required lengths and of uniform color, material, and size to protect tree trunks from damage by wires.

PART 3 - EXECUTION

3.1 PREPARATION OF PLANTING SOIL:

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.

B. Mix specified soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.

1. "Schedule of Planting Soil Mixture Requirements" is attached at end of this section.

C. For pit and trench type backfill, mix planting soil prior to backfilling, and stockpile at site.

D. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

1. Mix lime with dry soil prior to mixing of fertilizer.

3.2 PREPARATION OF PLANTING BEDS:

A. Loosen subgrade of planting bed areas to a minimum depth of 6 inches using a culti-mulcher or similar equipment. Remove stones measuring over 1 inch in any dimension. Remove sticks, stones, rubbish, and other extraneous matter.

B. Spread planting soil mixture to minimum depth required to meet lines, grades, and elevations shown, after light rolling and natural settlement. Place approximately 1/2 of total amount of planting soil required. Work into top of loosened subgrade to create a transition layer, then place remainder of the planting soil.

3.3 EXCAVATION FOR TREES AND SHRUBS:

A. Excavate pits, beds, and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.

1. For balled and burlapped (B&B) trees and shrubs, make excavations at least half again as wide as the ball diameter and equal to the ball depth, plus following allowance for setting of ball on a layer of compacted backfill:

   a. Allow for 12 inch thick setting layer of planting soil mixture.

2. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.

B. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.

C. Fill excavations for trees and shrubs with water and allow water to percolate out prior to planting.

3.4 PLANTING TREES AND SHRUBS:

A. Set balled and burlapped (B&B) stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball at same elevation as adjacent finished landscape grades. Remove burlap from sides of balls; retain on bottoms. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

B. Set container grown stock, as specified, for balled burlapped stock, except cut cans on 2 sides with an approved can cutter; remove bottoms of wooden boxes after partial backfilling so as not to damage root balls.

C. Dish top of backfill to allow for mulching.

D. Mulch pits, trenches, and planted areas. Provide not less than following thickness of mulch, and work into top of backfill and finish level with adjacent finish grades.

1. Provide 2 inches thickness of mulch.

E. Apply anti-desiccant, using power spray, to provide an adequate film over trunks, branches, stems, twigs and foliage.

   1. If deciduous trees or shrubs are moved when in full-leaf, spray with anti-desiccant at nursery before moving and spray again 2 weeks after planting.

F. Prune, thin out, and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character.

G. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

H. Wrap tree trunks of 2 inches caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures before wrapping.

I. Guy and stake trees immediately after planting, as indicated.

3.5 PLANTING GROUND COVER:

A. Space ground cover plants as indicated or scheduled, but not more than 24 inches o.c.

B. Dig holes large enough to allow for spreading of roots and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting.

C. Mulch areas between ground cover plants; place not less than 2 inches thick.

3.6 MAINTENANCE:

A. Begin maintenance immediately after planting.

B. Maintain trees, shrubs, and other plants until final acceptance, but in no case, less than following period:

   1. 120 days after substantial completion of planting.

C. Maintain trees, shrubs, and other plants by pruning, cultivating, and weeding as required for healthy growth. Restore planting saucers. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.

3.7 CLEANUP AND PROTECTION:

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.8 INSPECTION AND ACCEPTANCE:

A. When landscape work is completed, including maintenance, Architect will, upon request, make an inspection to determine acceptability.

B. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect and found to be acceptable.

3.9 SCHEDULE OF PLANTING SOIL MIXTURE REQUIREMENTS:

A. General: Provide the following soil mixes, preparing as indicated.

B. Deciduous Trees: For each tree pit, provide the following:

1. Topsoil as indicated.
2. Lime to adjust soil pH range as recommended.
3. Peat Humus: 1 lb.
4. Bonemeal: 1 lb.
5. Manure: 1 lb.
6. Fertilizer: 3 lbs.

C. Shrubs: For each shrub pit, provide the following:

1. Topsoil as indicated.
2. Lime to adjust soil pH range as recommended.
3. Peat Humus: 1/2 lb.
4. Superphosphate: 1/2 lb.
5. Manure: 1/2 lb.
6. Fertilizer: 1 lbs.

D. Planting Beds: Provide the following:

1. 10 parts loam.
2. 2 parts Lime.
3. 4 parts Peat Humus.
4. 1 part Superphosphate.
5. 2 parts Manure.
6. 1 part Fertilizer.

END OF SECTION 02900

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.2 DESCRIPTION OF WORK

A. All materials and labor required for the complete installation of the work of this Section, including but not limited to the following:

1. Furnishing, placing, curing, finishing, and protection of reinforced cast-in-place normalweight concrete and lightweight concrete.
2. Furnishing and erection of formwork, shoring and removal of same.
3. Furnishing and placing of reinforcing steel and related positioning and securing accessories, including galvanizing where specified.
4. Furnishing and installation of admixtures, inserts for connections to steel members, flashing reglets, and similar items in conjunction with concrete work.
5. Installation of anchor bolts.
6. Furnishing and installation of non-shrink grout under leveling plates and base plates, and at pockets in concrete slabs, walls, or beams left open temporarily, and at other locations as applicable.
7. Furnishing and installation of concrete housekeeping pads, inertia blocks, and foundations for mechanical-, plumbing-, and electrical equipment.
8. Installation of items furnished by other sections (such as anchors, sleeves, bolts and plates), and required to be cast into concrete.

9. Concrete fill in steel stairs.

10. Make provisions in forms for proper location and installation of pipe sleeves, duct openings, keys, chases, electrical boxes, bolts, anchors, inserts, and similar items, as required by other trades. Notify appropriate trades when items noted are ready for installation.

11. Unless specifically excluded, furnishing and installation of any other items of cast-in-place concrete work indicated on drawings, specified, or obviously needed to make work of this Section complete.

B. Related work specified elsewhere:

1. Earthwork

2. Structural Steel

3. Masonry

4. Steel Joists

5. Metal Decking

6. Miscellaneous Metals

1.3 STANDARDS

A. Except as otherwise specified herein, perform work in accordance with specifications noted below, including latest editions of applicable specifications, codes, and standards cited therein, and latest applicable addenda and supplements. Copies of these items shall be kept available in shop and field. Field copies shall be purchased by the General Contractor and kept in the field.

1. "The Commonwealth of Massachusetts State Building Code", latest edition.

2. "Building Code Requirements for Reinforced Concrete" ACI 318-89, American Concrete Institute.

3. "Specifications for Structural Concrete for Buildings" ACI 301-84 (included as part of this specification).

4. ACI 302 "Guide for Concrete Floor and Slab Construction".

5. ACI 308 "Standard Practice for Curing Concrete".

6. CRSI 59, "Recommended Practice for Placing Reinforcing Bars".

7. CRSI 63, "Recommended Practice for Placing Bar Supports".

B. Any material or operation specified by reference to published specifications of manufacturer or published standard shall comply with said specification or standard. In case of conflict between referenced specifications, most stringent requirement shall govern. In case of conflict between referenced specifications and Project Specifications, Project Specifications shall govern.

1.4 SUBSTITUTIONS

A. Substitutions for member sizes, type(s) of concrete, connection details or any other modifications proposed by Contractor will be considered by Designer only under following conditions:

1. That request has been made and accepted prior to submission of Shop Drawings.

2. That there is a substantial cost advantage or time advantage to Owner; or that proposed revision is necessary to obtain required materials or methods at proper times to accomplish work in time scheduled.

3. That sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by Designer, including cost reductions or savings in time to complete work.

4. That the cost of reviewing the substitutions shall be borne entirely by the Contractor.

1.5 SUBMITTALS

A. Job Standards: Submit to Designer, in accordance with requirements of Section 01300, "job standards" for reinforcing steel and formwork details proposed prior to submitting detailed Shop Drawings.

B. Concrete Constituents: Submit to Designer, in accordance with requirements of Section 01300, a detailed list of concrete materials, and corresponding sources, proposed for use in concrete for this project. If conveying concrete (normalweight concrete only) by pump is requested by Contractor related data regarding concrete materials, pumping device, and methods shall be submitted to Designer for approval three weeks before such method is proposed for use. Tests for approval of concrete mixtures to be pumped shall be paid for by Contractor.

C. Methods of Construction: Submit to Designer, in accordance with requirements of Section 01300, prior to starting work, description of methods, sequence of construction, and type of equipment proposed for use for performing cast-in-place concrete work. This submission shall not relieve Contractor of his responsibility for providing proper methods, equipment, workmanship, and safety precautions.

D. Shop Drawings: Submit to Designer, in accordance with requirements of Section 01300, detailed Shop Drawings, including erection drawings and schedules.

1. Reinforcement Drawings: Prepare in accordance with ACI 315, "Manual of Standard Practice for Detailing Reinforced Concrete Structures" and show following: elevations; dimensions of concrete work with specified reinforcement clearances; ledges, brackets, openings, sleeves or other items furnished by other Sections, where interference with reinforcement may occur; bending diagrams; assembly diagrams; splices and laps of reinforcement; temperature and shrinkage reinforcement; construction joint reinforcement; and shapes, dimensions, grade designations, and details of reinforcement and accessories. Show dowels with concrete work to be placed first.

2. Formwork Drawings: prepare formwork drawings and detail the following: elevations and dimensions of all concrete work; ledges; brackets; openings; sleeves or other items furnished by other sections; schedule of placements; form tie location; construction joints and control joints with methods of forming; and general arrangement, sizes and grades of lumber, panels and alignment.

3. Except as otherwise noted, approval of Shop Drawings will be for size and arrangement of components. Errors in dimensions shown on Shop Drawings shall be responsibility of Contractor. Check and coordinate cast-in-place concrete work with work of other trades before submitting Shop Drawings.

4. Do not proceed with fabrication of material or performance of work until corresponding item on Shop Drawing has been approved by Designer.

E. Samples: Submit to Designer, in accordance with requirements of Section 01300, samples and/or descriptive literature of materials, products, and methods as noted herein, and as otherwise requested by Designer: concrete constituents including admixtures; form ties (including cones) and spreaders; accessories for reinforcement; reglets; non-shrink cement grout; inserts, and form release agents. Do not proceed with fabrication of material/product or performance of work until Sample has been approved by Designer.

F. Mill Test Certification: Submit to Designer, in accordance with requirements of Section 01300, prior to delivery of reinforcing steel or concrete to job site, certified mill test reports of reinforcing steel and cement, (including names and locations of mills and shops, and analyses of chemical and physical properties), properly correlated to concrete to be used in this project.

G. Concrete Curing and Protection: Submit to Designer, in accordance with requirements of Section 01300, detailed methods proposed for curing concrete.

H. Corrective Work: Submit to Designer, in accordance with requirements of Section 01300, drawings showing details of any proposed corrective work.

I. Affidavit: Submit to Designer, on request by Designer, manufacturer's and/or supplier's and/or installer's affidavit stating that material or product provided complies with Contract Documents.

1.6 INSPECTION, TESTING, AND QUALITY CONTROL

A. Inspection and testing of cast-in-place concrete work will be performed by an independent Testing Agency, under a separate contract with the Owner. Materials and workmanship shall be subjected to inspection and testing in mill, shop and/or field by Designer and/or Testing Agency. Such inspection and testing shall not relieve Contractor of his responsibility to provide his own inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of this section.

B. Requirements of this section are generally written for purpose of securing best workmanship and end result.

Certain deviations may be desirable under certain project conditions, however, and may be allowed only after examination by and upon written approval of Designer. Any such approved deviation shall not be construed as a waiver of requirements of Specifications.

C. Contractor shall investigate source of and allow access to materials required to be sampled and tested by Testing Agency.

D. Sampling and testing required by Designer to determine if materials proposed for use in project comply with Specification requirements shall be made by Testing Agency prior to actual use of materials in project. Contractor shall coordinate with Designer and Testing Agency to insure that materials are supplied, sampled, tested and approved so as not to delay progress of job.

E. Whenever source, quality, or characteristics of approved material changes, or indicates lack of compliance with requirements of Contract Documents, Contractor shall resubmit additional materials for Testing Agency to sample and test until requirements are satisfied. Cost of additional sampling, testing, and inspection of materials and workmanship not originally conforming to requirements of Contract Documents shall be at Contractor's expense.

F. During progress of work, provide free and safe access to work at all times to Designer and Testing Agency so as to make possible proper inspection of work.

G. Notify Designer and Testing Agency prior to start of any phase of concrete work so as to afford them reasonable opportunity to inspect work. Such notification shall be made at least 24 hours in advance for concrete placements and at least 36 hours in advance for other inspections (forms, rebars, etc.).

H. Proceed with form construction, installation of embedded items, and reinforcement, but do not place concrete into or around such items until Designer has approved work.

I. Facilitate inspection and testing by Testing Agency. Contractor shall, at his own expense, furnish Testing Agency upon request with:

1. Information as to time and place of shipments of materials to plant and project site.

2. Representative sample pieces requested for testing.

3. Full and ample means and assistance for sampling and testing materials and proper facilities for inspection of work in plant and at proper site.

4. Covered box large enough to contain twenty-four standard concrete cylinders. At temperatures below 60 degrees F., box shall be electrically heated to maintain inside temperature of 60 to 80 degrees F. Cylinders shall be placed in box during molding and shall be covered with moist burlap until delivery to laboratory, 24 to 72 hours after molding.

5. Copies of mill test reports of shipments of cement and reinforcing steel.

J. Compression tests shall consist of one set of four cylinders for each test made, cured, and tested by Testing Agency during progress of job. One set of cylinders shall be taken for every 50 cubic yards of concrete or fraction thereof, and furthermore shall be taken from batch with highest slump.

K. Slump test, to check consistency, shall be made from sample used to mold cylinders. Additional slump test shall be taken of every batch delivered to job site as required.

L. Test for determination of air content shall be made for at least every third set of test cylinders and at least once daily or more often if adjustment is required to satisfy specifications. .

M. Sampling, molding, curing, and testing of cylinders shall conform to ASTM requirements. Specimens shall be cured under laboratory conditions. Designer may require additional cylinders to be cured under field conditions when unusual conditions may tend to reduce concrete strength.

N. Unless otherwise directed by Designer, one cylinder of each set shall be tested for 7-day strength, two for 28-day strength, and save one for 56-day strength test if required.

O. Report of tests submitted to Designer shall include: name of job, date and location of pour, design strength of concrete, mix data, slump, air content (if tested), compressive strength, age and condition of test cylinder, type of fracture, and type of curing.

P. Designer has authority to order, for any strength of concrete, increase in cement content and mix redesign for remaining work if either:

1. Average 7-day strength of any two tests representing a particular design strength is less than 55 percent of specified strength; or

2. Average 28-day strength of any two tests representing a particular design strength is less than 90 percent of specified strength.

Q. Average of any three consecutive 28 day strength tests representing each class of concrete shall be equal to or greater than specified strength (f'c) and not more than 10 percent of strength tests shall have values less than specified strength, but no test shall show an average strength (of any one set of cylinders) less than 85 percent of specified strength (f'c).

R. When tests of control specimens fall below these requirements, Designer may require 56 day cylinder tests or core specimens taken from concrete in question and tested in accordance with ASTM C42. If these specimens do not meet strength requirements, Designer will have right to require additional curing, load tests, strengthening or removal and replacement of those parts of structure which are unacceptable, and in addition, removal of such sound portions of structure as necessary to insure safety, appearance, and durability of structure. Additional testing, load tests, strengthening or removal and replacement of parts of structure and any costs associated with delay of project shall be at Contractor's expense.

S. Any material or workmanship which is rejected by Designer and/or Testing Agency either at plant or at job site, shall be replaced promptly by Contractor to satisfaction of Designer and/or Testing Agency, and at no expense to the Owner.

T. Contractor shall carry out corrections without delay as directed by Designer and/or Testing Agency when construction operations indicate that requirements of Contract Documents or prudent construction practices are being or about to be violated.

U. If arrangements for corrections and/or replacements are not made within seven days after notice of rejection, the Owner shall have right to have corrections and/or replacement made and charge cost thereof and any costs associated with delay of project against balance of monies withheld.

V. Acceptance of work and admixtures in plant shall not prevent final rejection at job site upon arrival or even after it has been installed, if work is found to be defective in any way.

W. Portions of structure which do not meet requirements of Contract Documents based on appearance, or for any other aesthetic reason, shall be corrected or removed and replaced as directed by Designer. Cost of such correction or removal and replacement shall be at Contractor's expense.

PART 2 PRODUCTS

2.1 CONCRETE CONSTITUENTS

A. Cement: shall be American-made Portland Cement, free from water soluble salts or alkalies which will cause efflorescence on exposed surfaces. Portland Cement shall be Type II, ASTM C150.

Use only one brand of cement for each type of cement throughout project. Contractor shall be responsible for whatever steps are necessary to insure that no visual variations in color will result in exposed concrete and shall place on order and secure in advance a sufficient quantity of this cement to complete concrete work specified herein.

B. Normalweight Fine Aggregate: shall be washed, inert, natural sand conforming to ASTM C33 and following additional requirements:

Sieve	Retained Percent
#4	0 - 5
#16	25 - 40
#50	70 - 87
#100	93 - 97

Fineness Modulus	2.80 (Plus/Minus 0.20)
Organic	Plate 2 maximum
Silt	2.0 percent maximum
Mortar Strength	100 percent minimum compression ratio
Soundness	5 percent maximum loss, magnesium sulfate, five cycles

C. Normalweight Coarse Aggregate: shall be well graded crushed stone or washed gravel conforming to ASTM C33 and following additional requirements:

Designated Size (inches)	3	2	1-1/2	1	3/4	1/2	3/8	
F.M. (+/- 0.20)		7.95	7.45	7.20	6.95	6.70	6.10	4.50

Organic	Plate 1 maximum
Silt	1.0 percent maximum
Soundness	5 percent maximum loss, magnesium sulfate, five cycles

Maximum designated sizes for normalweight coarse aggregate to be used in concrete sections shall be as noted below, except that sizes shall also be chosen in conjunction with required clearances.

1. One and one-half inches for sections over twelve inches in thickness.

2. Three-quarter inch for sections less than twelve inches in thickness.

D. Concrete Fill for Steel Stair and Landing Pans: shall be composed of 1:2:2 mix with three-eighths inch maximum size normalweight aggregate and shall be placed with a 0 inches to 1 inch slump.

E. Water: shall be from approved source, potable, clean and free from oils, acids, alkali, organic matter and other deleterious material.

F. Admixtures:

1. Water-reducing agent:

   a. "WRDA with Hycol" - W.R. Grace & Co.

   b. "PDA25" - Protex Industries, Inc.

   c. "Pozzolith 344H" - Master Builder's Co.

   d. "Eucon WR-75" - Euclid Chemical Co.

   e. Or approved equal conforming to ASTM C494 Type A.

   Note: Water-reducing agent shall be by same manufacturer as air-entraining agent.

2. Air-entraining agent:
   - a. "DAREX AEA" - W.R. Grace & Co.
   - b. "PROTEX AEA" - Protex Industries
   - c. "MB-VR" or "MB-AE" - Master Builder's Co.
   - d. "Air-Mix" - Euclid Chemical Co.
   - e. Or approved equal conforming to ASTM C260.
3. Admixtures retarding setting of cement in concrete shall not be used without written approval of Designer.
4. Admixtures causing accelerated setting of cement in concrete shall not be used.

2.2 CONCRETE MIXTURES

A. The Contractor shall recommend, on the basis of trial mixes and strength curves specified below, design mixes for each type and strength of concrete. The Testing Agency will verify that the proposed mix designs conform to all specification requirements.

B. Sufficient materials for concrete mix design shall be furnished by Contractor not less than five weeks before use. Duplicate small samples plainly and neatly labeled with source, where proposed to be used, date, and name of collector shall be provided and presented to Testing Agency for permanent reference.

C. Mixes shall be designed in accordance with "Method 1" of ACI 301, and the requirements of this Section. Normalweight concrete shall have an air-dry weight not to exceed 150 lbs. per cubic foot.

D. Limiting values shown in Table A apply for specific strengths of concrete with coarse aggregates less than one and one-half inches unless noted otherwise.

Table A

Minimum Allowable Compressive Minimum Permissible Cement Strength at 28 day (psi) Factor - Sacks/Cubic Yards**		Maximum Allowable water/cement ratio*
4000	0.45	6.70

3000	0.45	5.50

* Maximum; decrease if possible. This represents total water in mix at time of mixing, including free water on aggregate.

** Minimum; increase as necessary to meet other requirements.

E. In all slabs and walls exposed to weather, all concrete shall contain the approved air-entraining admixture as per manufacturer's written instructions, to provide entrained air, by volume, in the cured concrete within 4.5 to 6.5 percent.

F. Water-Reducing Admixture - The approved water-reducing admixture shall be used in all concrete, in accordance with manufacturer's written instructions.

G. Water content and cement content of concrete to be used in work shall be based on curve showing relation between water content, cement content, and 7 and 28 day compressive strengths of concrete made using proposed materials. Curves shall be determined by four or more points, each representing an average of at least three test specimens at each age, and shall have range of values sufficient to yield desired data, including all compressive strengths required by Contract Documents, without extrapolation. Design mix of concrete to be used in work, as determined from curve, shall correspond to following test strengths (TABLE B) obtained in laboratory trial mixtures, but in no case shall resulting mix conflict with limiting values as specified in TABLE A.

TABLE B

Minimum Strength of Laboratory Trial Mixes (psi)

Design Strength	Trial Mix Strength 7-days	Trial Mix Strength 28-days
4000	3800	5000
3000	2700	3750

H. Any deviation from approved mix design, which Contractor deems desirable under certain project conditions, will not be allowed without written approval of Designer. Cost of any additional testing by Testing Agency associated therewith shall be paid for by Contractor.

2.3 FORM MATERIALS

A. Unexposed Concrete Surfaces: Forms shall be made of wood, metal, or other material subject to approval of Architect.

B. Exposed Concrete Surfaces: 5/8-inch plywood coated with form release oil; molded fiberglass or other smooth coated material subject to approval of Architect.

C. Chamfer Strips: shall be half-inch, 45 degree poplar wood strips, nailed six inches on center, and installed in inside corners of all forms, unless otherwise directed by Designer.

E. Form Ties and Spreaders: shall be Richmond Tyscrus by Richmond Screw Anchor Co.; Superior-ties by Superior Concrete Accessories, Ind.; Sure-Grip Ties by Dayton Sure-Grip and Shore Co.; or equal approved by Designer. Wire ties shall not be used. Ties for foundation walls shall be snap-ties or type specified above with removal cones and shall incorporate water seal washer.

F. Form Release Agent: shall be of a non-staining and non-emulsifiable type, or equal approved by Designer. Form release agent shall not impart any stain to concrete nor interfere with adherence of any material to be applied to concrete surfaces.

2.4 REINFORCEMENT AND ACCESSORIES

A. Reinforcing Steel Bars: shall be newly rolled billet steel conforming to ASTM A615 Grade 60. Bars shall be bent cold.

B. Welded Wire Fabric: shall conform to ASTM A185.

C. Reinforcement Accessories: shall conform to Product Standard PS7-766, National Bureau of Standards, Department of Commerce, Class C, as produced by Superior Concrete Accessories, Inc.; Dayton Sure-Grip Co.; R.K.L. Building Specialties Co., Inc; or equal approved by Designer. Reinforcement accessories shall include spacers, chairs, ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing, spacing, supporting, and fastening reinforcement. Tie wire shall be galvanized or stainless wire of sufficient strength for intended purpose, but not less than No. 18 gage. Metal supports shall be of such type as not to penetrate surface of formwork and show through surface of concrete. Accessories touching interior formed surfaces exposed to view shall have not less than 1/8 inch of plastic between metal and concrete surface. Plastic tips shall extend not less than 1/2 inch up on metal legs. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.

2.5 MISCELLANEOUS MATERIALS

A. Grout: shall be ready-to-use metallic aggregate product requiring only addition of water at job site such as "Embeco Pre-mixed Grout" by Master Builder's; "Vibro-Foil Ready-Mixed" by W.R. Grace & Co.; "Ferrolith G" by Sonneborn Building Products, Inc.; or equal approved by Designer. Grout shall be easily workable and shall have no drying shrinkage at any age. Compressive strength of grout (2" x 2" cubes) shall not be less than 5000 psi at 7 days, and 7500 psi at 28 days.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to the Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

3.2 HANDLING, STORAGE, AND PROTECTION OF MATERIALS

A. Handle and store materials separately in such manner as to prevent intrusion of foreign matter, segregation, or deterioration. Do not use foreign materials or those containing ice. Remove improper and rejected materials immediately from point of use. Cover materials, including steel reinforcement and accessories, during construction period. Stockpile concrete constituents properly to assure uniformity throughout project.

3.3 ERECTION OF FORMWORK, SHORING AND RESHORING

A. Set and maintain formwork to insure complete concrete work within tolerance limits listed in ACI 347 latest edition, "Recommended Practice for Concrete Formwork".

B. For a minimum of one hour prior to concrete placement, wet forms continuously with water to swell forms in order to prevent leakage of concrete matrix and to minimize absorption of concrete matrix water by form materials. This requirement may be waived by Designer for those specific cases where he deems it unnecessary or impractical. Care must be exercised to prevent a build-up of water at base of forms.

C. Before form materials can be re-used, surfaces that will be in contact with freshly cast concrete shall be thoroughly cleaned, damaged areas repaired and projecting nails withdrawn. Re-use of form material shall be subject to approval by Designer.

3.4 PLACING OF REINFORCEMENT

A. Reinforcement shall be placed in accordance with requirements of CRSI 68, "Recommended Practice for Placing Reinforcing Bars" and CRSI 63, "Recommended Practice for Placing Bar Supports" and with further requirements below.

B. Reinforcement shall be accurately placed in accordance with Contract Documents and shall be firmly secured in position by wire ties, chairs, spacers, and hangers, each of type approved by Designer.

C. Bending, welding or cutting reinforcement in field in any manner other than as shown on Drawings, is prohibited, unless specific approval for each case is given by Designer.

D. Reinforcement shall be continuous through construction joints unless otherwise indicated on Drawings.

E. Reinforcement shall be spliced only in accordance with requirements of Contract Documents or as otherwise specifically approved by Designer. Splices of reinforcement at points of maximum stress shall generally be avoided. Welded wire fabric shall lap twelve inches or two space plus two inches whichever is larger, and shall be wired together.

F. At time concrete is placed, reinforcement shall be free of excessive rust, scale, or other coatings that will destroy or reduce bond requirements. Reinforcement expected to be exposed to weather for a considerable length of time shall be painted with a heavy coat of cement grout. Protect stored materials so as not to end or distort bars in any way. Bars that become damaged will be rejected.

G. Before concrete is cast, check all reinforcement after it is placed to insure that reinforcement conforms to Contract Documents and approved Shop Drawings. Such checking shall be done only by qualified experienced personnel. In addition, the Designer shall be notified at least 36 hours prior to concrete placement and given opportunity to inspect completed reinforcement and formwork before concrete placement. Prior approval of Shop Drawings shall in no way limit Designer's right to demand modifications or additions to reinforcement or accessories.

3.5 JOINTS

A. Construction and control joints indicated on Drawings are mandatory and shall not be omitted.

B. Joints not indicated or specified shall be placed to least impair strength of structure and shall be subject to approval of Designer.

3.6 INSTALLATION OF EMBEDDED ITEMS

A. Conduits and pipes shall not be embedded in concrete cast on metal deck. Conduits and pipes in first floor slab shall conform to the requirements of ACI 318, paragraph 6.3 "Conduits and Pipes Embedded in Concrete".

B. Install steel sleeves, furnished by other trades, at locations shown on the drawings.

C. Anchor bolts for column baseplates shall be installed with templates provided. Vertical alignment and plan locations shall be maintained within one-sixteenth inches of the locations shown on the drawings.

3.7 MIXING, CONSISTENCY, AND DELIVERY OF CONCRETE

A. Concrete shall be ready-mixed, produced by plant acceptable to Designer. Hand or site mixing shall not be done. Constituents, including admixtures except certain corrosion inhibitors and superplasticizers, shall be batched at central batch plant. Admixtures shall be premixed in solution form and dispensed as recommended by manufacturer.

B. Central plant and rolling stock equipment and methods shall conform with Truck Mixer and Agitator Standard of Truck Mixer Manufacturer's Bureau of National Ready-Mixed Concrete Association, and Contract Documents. Consistency of concrete at time of deposit shall be as follows:

Portion of Structure Maximum Slump Range		Recommended Slump
Walls, pile caps	4"	3" - 5"
Slabs, beams	3"	2" - 4"

C. Ready mixed concrete shall be transported to site in watertight agitator or mixer trucks loaded not in excess of rated capacities. Discharge at site shall be within one and one-half hours after cement was first introduced into mix. Concrete with a temperature greater than 85 degrees F. shall not be placed. Central mixed concrete shall be plant mixed a minimum of five minutes. Agitation shall begin immediately after premixed concrete is placed in truck and shall continue without interruption until discharged. Transit mixed concrete shall be mixed at mixing speed for at least ten minutes immediately after charging truck followed by agitation without interruption until discharged.

D. Retempering of concrete which has partially hardened, that is, mixing with or without additional cement, aggregates, or water, will not be permitted.

3.8 PLACING CONCRETE

A. Intent of this Specification is that concrete shall not be pumped. Refer to "Submittals, Concrete Constituents", in this Section for requirements should pumping be proposed.

B. Remove water and foreign matter from forms and excavations and, except in freezing weather or as otherwise directed, thoroughly wet wood forms just prior to placing concrete. Place no concrete on frozen soil and provide adequate protection against frost action during freezing weather.

C. To secure full bond at construction joints, surfaces of concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials and laitance, roughened with suitable tools such as chipping hammers or wire brushes, and recleaned by stream of water or compressed air. Well before new concrete is deposited, joints shall be saturated with water. After free or glistening water disappears joints shall be given thorough coating of neat cement slurry mixed to consistency of very heavy paste. Surface shall receive coating of approximately one-eighth inch thick; this shall be scrubbed in by means of stiff bristle brushes. New concrete shall be deposited before neat cement dries or changes color.

D. Do not place concrete having slump outside of allowable slump range.

E. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of ingredients and displacement of reinforcement, and which avoid rehandling. Deposit no partially hardened concrete. When concrete is conveyed by chutes, equipment shall be of such size and U-shaped design as to insure continuous flow in chute. Flat (coal) chutes shall not be employed. Chutes shall be of metal or metal lines and different portions shall have approximately same slope. Slope shall not be less than 25 degrees nor more than 45 degrees from horizontal and shall be such as to prevent segregation of ingredients. Discharge end of chute shall be provided with baffle plate or spout to prevent segregation. If discharge end of chute is more than five feet above surface of concrete in forms, spout shall be used, and lower and maintained as near surface of deposit as practicable. When operation is intermittent, chute shall discharge into hopper. Chute shall be thoroughly cleaned before and after each run and debris and any water used shall be discharged outside forms. Concrete shall not be allowed to flow horizontally over distances exceeding five feet.

F. Concrete shall be placed in such manner as to prevent segregation, and accumulations of hardened concrete on forms or reinforcement above mass of concrete being placed. To achieve this end, suitable hoppers, spouts with restricted outlets and tremies shall be used as required.

G. During and immediately after depositing, concrete shall be thoroughly compacted by means of internal type mechanical vibrators or other tools, or by spading to produce required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on only enough to produce homogeneity and optimum consolidation without permitting segregation of constituents or "pumping" of air. Vibrators used for normalweight concrete shall operate at speed at not less than 7,000 vpm and be of suitable capacity. Do not use vibrators to move concrete. Vibration shall be supplemented by proper wooden spade puddling to remove included bubbles and honeycomb adjacent to visible surfaces. At least one vibrator shall be on hand for every 10 cubic yards of concrete placed per hour, plus one spare. Vibrators shall be operable and on site prior to starting placement.

H. Vertical lifts shall not exceed 18 inches. Vibrate completely through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone pockets, honeycomb, and segregation.

I. Concrete shall be deposited continuously, and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within section. If section cannot be placed continuously between planned construction joints, as specified, field joint and additional reinforcement shall be introduced so as to preserve structural continuity. Designer shall be notified in any such case.

J. Cold joints, particularly in exposed concrete, including "honeycomb", are unacceptable. If they occur in concrete surfaces exposed to view, Designer will require that entire section in which blemish occurs be removed and replaced with new materials at Contractor's expense.

K. When placing exposed concrete walls or columns, strike corners of forms rapidly and repeatedly from outside along full height while depositing concrete and vibrating.

L. Chutes, hoppers, spouts, adjacent work, etc. shall be thoroughly cleaned before and after each run and water and debris shall be discharged outside form.

3.9 FINISHING OF UNFORMED CONCRETE SURFACES

A. Motor Float finish: Level surface and remove excess laitance by tamping, screeding, and preliminary wood floating. When the slab has hardened sufficiently so that water and fine material will not be worked to the top, compact the surface with motor-driven floats of the disc type. Leave floors with a smooth finish and true to a maximum tolerance of 1/8 inch in 10 feet. Motor float finish surfaces scheduled to receive the following:

1. Thin-set ceramic tile and marble.

2. Carpeting.

3. Cementitious waterproofing.

B. Monolithic Floor Finish: Level surface and remove excess laitance by tamping, screeding, and preliminary wood floating. When the slab has hardened sufficiently so that water and fine material will not be worked to the top, compact the surface with motor-driven floats of the disc type and trowel smooth with two steel troweling operations. Do the second troweling after the concrete has become so hard that no mortar will adhere to the edge of the trowel, and exert heavy pressure to thoroughly compact the surface. Leave floors with a smooth, hard finish free of blemishes and true to a maximum tolerance of 1/8 inch in 10 feet. Provide monolithically finish surfaces on areas where no other finish is specified.

C. Rough struck surface shall be provided at top of pile caps.

D. Contractor, at his own expense, shall level depressed spots and grind high spots in concrete surfaces which are in excess of specified tolerances. Leveling materials proposed for providing proper surface shall be approved by Designer.

3.10 REPAIRING OF UNFORMED CONCRETE SURFACES

A. Tops of slabs and walls shall be repaired by using either same material as originally cast or by use of dry-pack material, as approved by Designer. Areas affected shall be chipped back square and to depth of one inch minimum. Hole shall then be moistened with water for a minimum of two hours, followed by brush coat of 1/16 inch thick cement paste. Immediately plug hole with concrete, or with dry pack material consisting of 1:1.5 mixture of cement and concrete sand mixed slightly damp to touch. Hammer dry-pack into hole until dense, and excess paste appears on surface. Finish patch flush and to same texture as surrounding concrete. For large repairs employ 1-1-2 mixture of cement, concrete sand and pea gravel at same dry-pack consistency.

3.11 CURING AND PROTECTION

A. When concrete is placed at or below ambient air temperatures of 40 degrees F. or whenever in opinion of Designer, such or lower temperatures are likely to occur within 48 hours after placement of concrete, cold weather concreting procedures, according to ACI 306 and as specified herein, shall be followed. To this end, entire area affected shall be protected by adequate housing or covering, and heating. No salt, chemicals or other foreign materials shall be used in the mix to lower freezing point of concrete.

B. Protect concrete work against injury from heat, cold, and defacement of any nature during construction operations.

C. Concrete shall be treated and protected immediately after concreting or cement finishing is completed, to provide continuous moist curing above 50 degrees F. for at least seven days, regardless of ambient air temperatures.

D. Curing compounds will not be permitted for slab, beams, and pile caps.

E. Keep permanent temperature record showing date and outside temperature for concreting operations. Thermometer readings shall be taken at start of work in morning, at noon, and again late in afternoon. Locations of concrete placed during such periods shall likewise be recorded, in such manner as to show any effect temperatures may have had on construction. Copies of temperature record shall be distributed daily to Designer.

3.12 REMOVAL OF FORMWORK, SHORING AND RESHORING

A. Contractor shall be responsible for proper removal of formwork, shoring, and reshoring.

B. Forms shall be removed only after concrete has attained sufficient strength to support its own weight, construction loads to be placed thereon and lateral loads, without damage to structure or excessive deflection.

C. Forms and supports shall remain in place for not less than minimum periods of time noted below. These periods represent cumulative number of days or fractions thereof, consecutive unless otherwise approved by Designer during which time mean daily air temperature at surfaces of concrete is above 50 degrees F.

1. Vertical surfaces: concrete shall have reached 100 day-degrees# and shall have attained strength of not less than 30 percent of f'c. Where such forms also support formwork for slab or beam soffits, removal times for latter shall govern.

2. Horizontal surfaces: except as noted below, concrete shall have reached 300 day-degrees# of curing and attained strength of not less than 60 percent of f'c.

    a. Soffits of beams or girders shall remain supported and in place until concrete has attained 600 day-degrees#.

b. Forms and supports of floor slabs shall remain in place until concrete has reached 400 day-degrees#.

#Definition of day-degrees: Total number of days times mean daily air temperature at surfaces of concrete. For example, five days at temperature of 60 degrees F. equals 300 day degrees. Days or fractions of days in which temperature is below 50 degrees F. shall not be included in calculation of day-degrees.

D. Form removal shall be so performed that reshores are placed at same time as stripping operations, and that no area larger than one-fourth of a slab panel is unsupported at any time.

E. Any test cylinders required to verify the specified minimum strengths for form removal shall be field cured under the same conditions as the concrete they represent. Such cylinders and testing shall be at the Contractor's expense.

3.13 REPAIRING AND FINISHING OF FORMED CONCRETE SURFACES

A. Intent of this Specification is to require forms, mixtures of concrete, and workmanship so that concrete surfaces will require no patching, except for plugging of tie holes. However, where patching is acceptable to Designer, procedure described below shall be followed.

B. Defective concrete and honeycombed areas shall not be patched unless examined and approval is given by Designer. If such approval is received by Contractor, areas involved shall be chipped down square and at least one inch deep to sound concrete by means of cold chisels or pneumatic chipping hammers. If honeycomb exists around reinforcement, chip to provide clear space at least three-quarter inch wide all around steel to afford proper ultimate bond thereto. For areas less than one and one-half inches deep, patch shall be made in same manner as described above for filling unformed concrete surfaces, care being exercised to use crumbly-dry (non-trowelable) mixtures and to avoid sagging. Thicker repairs shall require build-up in successive days, each layer being applied as described. Repair mix shall be composed of 1 part cement to 1.5 part sand. After hardening, rub lightly as described above for form tie holes.

1. Mortar for patching shall be same mix as above except aggregate shall pass a No. 14 sieve.

2. For all concrete to receive "smooth" finish, remove formwork fins and clean entire surface of grease, form oil, laitance, dust, and other foreign matter.

3. "Smooth" finish shall consist of having all fins removed, joint marks smoothed off, blemishes removed, and surfaces left smooth and unmarred.

4. Begin finishing operations as soon as practicable after removal of forms, continue with curing operations after finishing is completed. After concrete has been well cured, carefully inspect surfaces. Remove any fins, rough spots, streaks, hardened mortar or grout and other foreign material. Patch defects with finishing mortar as specified above, to satisfaction of Designer.

C. Patches which become crazed, cracked, or sound hollow upon tapping shall be removed and replaced with new material at Contractor's expense.

3.14 CLEANING

A. Concrete surfaces shall be cleaned of objectionable stains as determined by the Designer. Materials containing acid in any form or methods which will damage "skin" of concrete surfaces shall not be employed, except where otherwise specified.

END OF SECTION

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The current edition of the following Technical Notes published by the Brick Institute of America is incorporated by reference in the work of this Section:

1. Note #1A: "Cold Weather Masonry Construction - Construction and Protection".
2. Notes #7/7A/7B: "Water Resistance of Brick Masonry - Design and Detailing, Materials, and Construction and Workmanship".
3. Notes 18/18A/18B: "Differential Movement - Cause and Effect, Expansion Joints, and Flexible Anchorage".
4. Note #28B: "Brick Veneer, Panel and Curtain Walls".

1.2 SUMMARY:

A. This Section includes clay unit masonry in the form of brick.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 07600, "Flashing and Sheet Metal", for exposed sheet metal flashing installed in masonry, however concealed flashing installed in masonry construction is included in the work of this Section.

2. Section 10200, "Louvers and Vents", for wall vents.

C. Products installed but not furnished under this Section include the following:

1. Steel lintels and miscellaneous steel items for embedment in brick masonry are specified in Section 05500, "Metal Fabrications".
2. Wood nailers and blocking built into unit masonry are specified in Section 06100, "Rough Carpentry".
3. Reglets in masonry joints for metal flashing are specified in Section 07600, "Flashing and Sheet Metal".
4. Hollow metal frames in unit masonry openings are specified in Section 08100, "Steel Doors and Frames".

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Provide unit masonry that develops installed compressive strengths (f'm) OF 1500 psi.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit and accessory product indicated.

C. Show location and details of anchorage devices to be embedded in other construction.

D. Samples for initial selection purposes of colored masonry mortar samples showing full extent of colors available.

E. Samples for verification purposes of the following:

1. Full-size units for each different exposed masonry unit required showing full range of exposed color, texture, and dimensions to be expected in completed construction.
2. Colored masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Label samples to indicate type and amount of colorant used.
3. Aluminum weep holes/vents painted in color to match mortar color.
4. Accessories embedded in the masonry.

F. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout including name of manufacturer, brand, and type.
2. Each type and size of anchors, ties, and metal accessories.

G. Material test reports from a qualified independent testing laboratory employed and paid by Owner indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1. Mortar mixes. Include description of type and proportions of grout ingredients.
2. Masonry units.

H. Cold-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.

I. Hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.

1.5 QUALITY ASSURANCE:

A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures," except as otherwise indicated.

  1. Revise ACI 530.1/ASCE 6 to exclude Sections 1.4 and 1.7; Parts 2.1.2, 3.1.2, and 4.1.2; and Articles 1.5.1.2, 1.5.1.3, 2.1.1.1, 2.1.1.2, and 2.3.3.9 and to modify Article 2.1.1.4 by deleting requirement for installing vent pipes and conduits built into masonry.

B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required.

  1. All exposed brick masonry for this project shall come from manufacturer's same production run.

C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

D. Preconstruction Testing: Owner will employ and pay a qualified independent testing laboratory to perform the following preconstruction testing as well as other inspection and testing services required by referenced unit masonry standard or indicated herein for source and field quality control:

  1. Brick tests: For each different brick unit indicated, units will be tested per ASTM C 67.
  2. Mortar composition and properties will be evaluated per ASTM C 780.

E. Field-Constructed Mock-Up: Prior to installation of clay unit masonry, erect sample wall panel to further verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work:

1. Locate mock-up on site in location as directed by Architect.
2. Build a mock-up for the following types of masonry in sizes of approximately 8 feet long by one building story high, including face brick, lintels, window unit, mortar pointing, and joint sealants:

   a. Typical exterior face brick wall with window opening.

3. Detail modifications may be made only as necessary to meet field conditions and to ensure proper fitting of the work and only as acceptable to Architect. Maintain general design concept shown without altering profiles and alignment shown.
4. Notify Architect one week in advance of the dates and times when mock-up will be erected.
5. Retain and maintain mock-up during construction in undisturbed condition as standard for judging completed unit masonry construction.

   a. When directed, demolish and remove mock-ups from Project site.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes.

C. Store cementitious materials off the ground, under cover, and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS:

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

C. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:

1. Do not lay masonry units that are wet or frozen.
2. Remove masonry damaged by freezing conditions.

D. Hot-Weather Construction: Comply with referenced unit masonry standard.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

2.2 CLAY MASONRY UNITS:

A. General: Comply with the following requirements applicable to each form of brick required:

1. Provide special molded shapes where indicated and as follows:

    a. For applications requiring brick of form, color, texture, and size on exposed surfaces that cannot be produced by sawing standard brick sizes.
    b. For applications where stretcher units cannot accommodate special conditions including those at corners, movement joints, bond beams, sashes, and lintels.

2. Provide units without frogs and with all exposed surfaces finished for ends of sills, caps, and similar applications that expose brick surfaces that otherwise would be concealed from view.

B. Face Brick Standard: ASTM C 216 and as follows:

1. Grade and Unit Compressive Strength: Provide units of grade and minimum average net area compressive strength indicated below:

    a. Grade SW.
    b. 3000 psi.

2. Type FBS (for general use in exposed masonry requiring wider variations in size and color ranges than Type FBX).

3. Size: Provide bricks manufactured to the following actual dimensions within the tolerances specified in ASTM C 216:

    a. Economy: 3-5/8 inches thick by 3-5/8 inches high by 7-5/8 inches long.

4. Shape units during manufacture by molding or extruding.
5. Application: Exterior brick veneer, unless otherwise indicated.
6. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. Color "A": "Old Port Narrow Range", Morin Brick.
    b. Color "B": "Standard Sea Gray", Belden Brick.

2.3 MORTAR MATERIALS:

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this article, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate for Mortar: ASTM C 144.

E. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

F. Water: Clean and potable.

G. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Colored Masonry Cement:

    a. "Colorbond Custom Color Masonry Cement," Centurion.
    b. "Atlas Custom Color Masonry Cement," Lehigh Portland Cement Co.
    c. "Flamingo Color Masonry Cement," The Riverton Corporation.

2. Colored Mortar Pigments:

    a. "Centurion Pigments," Centurion.
    b. "True Tone Mortar Colors," Davis Colors, A Subsidiary of Rockwood Industries, Inc.
    c. "SGS Mortar Colors," Solomon Grind-Chem Services, Inc.

2.4 TIES AND ANCHORS, GENERAL:

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.

B. Galvanized Carbon Steel Wire: ASTM A 82, coating class as required by referenced unit masonry standard for application indicated.

1. Wire Diameter: 0.1875 inch.

C. Galvanized Steel Sheet: ASTM A 366 (commercial quality) cold-rolled carbon steel sheet, hot-dip galvanized after fabrication to comply with ASTM A 525, Class B2 (for unit lengths over 15 inches) and Class B3 (for unit lengths under 15 inches), for sheet metal ties and anchors.

1. Thickness of Steel Sheet Galvanized After Fabrication: Uncoated thickness of steel sheet hot-dip galvanized after fabrication: 0.0747 inch (14 gage).

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. AA Wire Products Co.
2. Dur-O-Wal, Inc.
3. Heckman Building Products, Inc.
4. Hohmann & Barnard, Inc.
5. Masonry Reinforcing Corp. of America.
6. National Wire Products Industries.

2.5 ADJUSTABLE MASONRY VENEER ANCHORS:

A. General: Provide two-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it; for attachment over sheathing to metal studs; and with the following structural performance characteristics:

1. Structural Performance Characteristics: Capable of withstanding a 100 lbf load in either tension or compression without deforming over, or developing play in excess of, 0.05 inch.

B. Screw-Attached Masonry Veneer Anchors: Units consisting of wire tie section and metal anchor section complying with the following requirements:

1. Wire Tie Shape: Triangular.
2. Wire Tie Length: As required to extend 2 inches into masonry wythe of veneer face.
3. Anchor Section: Sheet metal plate, with screw holes top and bottom and with raised, rib-stiffened strap stamped into center to provide slot between strap and plate for connection of wire tie; of overall size indicated below:

    a. Size: Plate and strap size: 1-1/4 inches wide for plate, 5/8 inch for strap by lengths indicated below; slot clearance formed between face of plate and back of strap at maximum rib projection: 1/32 inch plus diameter of wire tie.
    b. Plate and Strap Lengths: 6 inches and 3-5/8 inches; with both sides of plate stiffened by ribs.

C. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, #10 diameter by length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating:

1. Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

D. Neoprene Gaskets: Screw-attached masonry veneer anchor manufacturer's standard closed cell neoprene gaskets manufactured to fit behind anchor plate and to prevent moisture from penetrating through screw holes to steel studs behind sheathing.

E. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Screw-Attached Masonry Veneer Anchors:

  - a. "DW-10," Hohmann & Barnard, Inc.
  - b. "DW-10HS," Hohmann & Barnard, Inc.
  - c. "DW-10-X," Hohmann & Barnard, Inc.

2. Organic-Polymer-Coated Steel Drill Screws:
   - a. "Traxx," ITW Buildex.
   - b. "Dril-Flex," Elco Industries, Inc.

2.6 EMBEDDED FLASHING MATERIALS:

A. Flashing, General: Fabricate from the following metal complying with requirements specified in Section 07600, "Flashing and Sheet Metal", and as indicated.

B. Laminated Copper-Fabric Flashing: Manufacturer's standard laminated flashing, copper sheet bonded with asphalt between 2 layers of glass fiber cloth.

1. Copper: 7 oz. weight per sq. ft.
2. Application: Fully concealed in masonry.
3. Available Products: Subject to compliance with requirements, products that may be incporporated in the work include, but are not limited to, the following:

   - a. "Copper Fabric", Afco Products, Inc.
   - b. "Type FCC-Fabric Covered Copper", Pheonix Building Products.
   - c. "Copper Fabric Flashing", Sandell Manufacturing Co., Inc.
   - d. "York Copper Fabric Flashing", York Manufacturing, Inc.

2.7 MISCELLANEOUS MASONRY ACCESSORIES:

A. Post-Installed Anchors: As described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Type: Sleeve-type expansion anchors, meeting FF-S-325, Group II, Type 3, Class 3, zinc plated.

B. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Plastic Weep Hole/Vent: One-piece flexible extrusion manufactured from ultraviolet-resistant polypropylene co-polymer, designed to weep moisture in masonry cavity to exterior, sized to fill head joints with outside face held back 1/8 inch from exterior face of masonry, in color selected from manufacturer's standard.

1. Available Products: Subject to compliance with requirements, weep hole/ventilators that may be incorporated in the Work include, but are not limited to, the following:

    a. "Cell Vent," Dur-O-Wal, Inc.

2.8 MASONRY CLEANERS:

A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned:.

1. For dark colored masonry not subject to metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting acids and special inhibitors.
2. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.
3. Available Products: Subject to compliance with requirements, a product that may be used to clean unit masonry surfaces includes, but is not limited to, the following:

    a. "Sure Klean No. 101 Lime Solvent," ProSoCo., Inc.
    b. "Sure Klean Vana Trol," ProSoCo, Inc.

2.9 MORTAR MIXES:

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification for job-mixed mortar and ASTM C 1142 for ready-mixed mortar, of types indicated below:

1. Unless otherwise indicated, use Type N or RN.

C. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

1. Mix to match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.

   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

C. Verify placement of supporting construction and that flashing and accessories installed by other trades have been properly installed.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL:

A. Comply with referenced unit masonry standards and other requirements indicated applicable to each type of installation included in Project.

B. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.

D. Comply with construction tolerances of referenced unit masonry standards.

3.3 LAYING MASONRY WALLS:

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less that nominal 4-inch horizontal face dimensions at corners or jambs.

   1. As indicated on drawings.

D. Stopping and Resuming Work: In each course, rack back 1/2-unit length; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

E. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

   1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

3.4 AIR SPACES:

A. Keep air spaces clean of mortar droppings and other materials during construction. Strike joints facing air spaces flush.

B. Tie exterior wythe to backup with individual metal ties. Stagger alternate courses.

3.5 ANCHORING SINGLE-WYTHE MASONRY VENEER:

A. Anchor single-wythe masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:

   1. Fasten each anchor section through sheathing to metal studs with 2 metal fasteners of type indicated.
   2. Embed tie section in masonry joints. Provide not less than indicated air space between back of masonry veneer wythe and face of sheathing.
   3. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.

B. Space anchors not more than 16 inches o.c. vertically and 16 inches o.c. horizontally with not less than one anchor for each 2 sq. ft. of wall area.

1. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 8 inches.

3.6 MOVEMENT (CONTROL AND EXPANSION) JOINTS:

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form expansion joints in brick made from clay or shale as follows:

1. Build in joint fillers where indicated.
2. Form open joint of width indicated but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07900, "Joint Sealers". Maintain joint free and clear of mortar.

C. Build in horizontal pressure-relieving joints where indicated; construct joints by inserting nonmetallic 50 percent compressible joint filler of width required to permit installation of sealant and backer rod specified in Section 07900, "Joint Sealers".

1. Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.7 LINTELS:

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and wherever openings of more than 1'-0" are shown or required by other construction.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.8 FLASHING/WEEP HOLES:

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing. Place flashing on sloping bed of mortar. Seal penetrations in flashing with adhesive/sealant/tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashings as follows:

1. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 6 inches, and fastened to sheathing. Lap building paper over up-turned flashing.
2. At heads and sills, extend flashing as specified above unless otherwise indicated but turn up ends not less than 2 inches to form a pan.
3. Interlock end joints of ribbed sheet metal flashings by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer and seal lap with elastomeric sealant complying with requirements of Division 7 Section "Joint Sealers" for application indicated.
4. Turn down sheet metal flashings at exterior face of masonry to form drip.

D. Install weep holes in the head joints in the first course of masonry immediately above embedded flashings and as follows:

1. Form weep holes with product specified in Part 2 of this Section.
2. Space weep holes 24 inches o.c.
3. In air spaces place pea gravel to a height equal to height of first course but not less than 2 inches immediately above flashing embedded in the wall, as masonry construction progresses, to splatter mortar droppings and to maintain drainage.

E. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.9 FIELD QUALITY CONTROL:

A. General: The following construction testing will be performed by an independent testing laboratory employed by the Owner. The Contractor shall furnish units and prisms to be tested.

B. Brick Tests: For each type and grade of brick indicated, units will be tested per ASTM C 67 except 5 bricks will be selected at random for each 100,000 units or fraction thereof installed.

C. Prism Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM E 447, Method B, and as follows:

1. Testing Frequency: Test one prism for each 5000 sq. ft. of wall area or portion thereof.
2. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.10 REPAIRING, POINTING, AND CLEANING:

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised" using the following masonry cleaner:

    a. Job-mixed detergent solution.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

END OF SECTION 04200

SECTION 05120 - STRUCTURAL STEEL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, services and transportation required to complete structural steel work shown on Drawings, as specified herein, or both, including but not limited to items noted below:

1. Furnishing of anchor bolts, and loose leveling plates.

2. Furnishing and erection of base plates, columns, tubes, channels, struts, beams, hangers, girders, trusses, bracing (temporary and permanent), brackets, anchors, angles, stiffeners, plates, bolsters, clips, support angles for metal deck, lintels or relieving angles affixed to structural steel, concrete slabs, spandrels or masonry block and corresponding connections (bolted and welded).

3. Furnishing and installation of openings (unreinforced and reinforced) in structural steel required to accommodate mechanical, plumbing, and electrical work.

4. Furnishing and application of hot-dip galvanizing for designated steel items.

5. Design and shop drawings of bolted/welded structural connections.

6. Furnishing and shop-installation of headed shear connectors (excluding shear connectors required for composite beam action) where shown on the drawings.

7. Hoisting of metal deck.

8. Furnishing of structural steel items, required to be built into or form part of work specified under other Sections, to appropriate trade at proper time with complete instructions and templates to facilitate installation. Verify proper installation of same.

9. Coordinate clearances with Divisions 15 and 16 for mechanical and electrical hanging devices.

10. Unless specifically excluded, furnishing and installation of any other items of structural steel work indicated on Drawings, specified or obviously needed to make work of this Section complete.

B. Related Work Specified Elsewhere:

1. Cast-in-Place Concrete
2. Masonry
3. Steel Joists
4. Metal Decking
5. Light Metal Framing
6. Fireproofing
7. Miscellaneous Metals
8. Painting

1.3 STANDARDS

A. Except as otherwise specified herein, perform work in accordance with specifications noted below, including latest editions of applicable specifications, codes, and standards cited therein, and latest applicable addenda and supplements. Copies of these items shall be kept available in shop and field. Field copies shall be purchased by the General Contractor.

1. "The Commonwealth of Massachusetts State Building Code", latest edition.

2. "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design", American Institute of Steel Construction, 1989.

3. "Code of Standard Practice for Steel Buildings and Bridges", American Institute for Steel Construction, 1986.

4. "Architecturally Exposed Structural Steel", American Institute of Steel Construction, latest edition.

5. "Structural Welding Code (AWS D.1)", American Welding Society, latest edition.

6. "Specifications for Structural Joints Using ASTM A325 or

A490 Bolts", Research Council on Riveted and Bolted Structural Joints of Engineering Foundation, 1986 as approved November 13, 1985.

7. ASTM A-6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use". The latest issue date as listed in ASTM Index shall apply.

B. Any material or operation specified by reference to published specifications of manufacturer or published standard shall comply with said specification or standard. In case of conflict between referenced specifications, most stringent requirement shall govern. In case of conflict between referenced specifications and Project Specifications, Project Specifications shall govern.

1.4 SUBSTITUTIONS

A. Substitutions for member sizes, type(s) of steel, connection details or any other modifications proposed by Contractor will be considered by Designer only under following conditions:

1. That request has been made and accepted prior to submission of Shop Drawings.

2. That there is a substantial cost advantage or time advantage to Owner; or that proposed revision is necessary to obtain required materials or methods at proper times to accomplish work in time scheduled.

3. That sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by Designer, including cost reductions or savings in time to complete work.

4. That the cost of reviewing the substitutions by the Designer shall be borne entirely by the Contractor.

1.5 SUBMITTALS

A. Job Standards: Submit to Designer, in accordance with requirements of Section 01300, "job standard" connection details proposed prior to submitting detailed Shop Drawings.

B. Joint Welding Procedures: Submit to Designer, in accordance with requirements of Section 01300, joint welding procedures and program of welding sequence (for each component and for welding components together) before any welding is done. After return of submittal, welding procedures and sequences shall be followed without deviation. Designer may require requalification of these welding procedures by tests prescribed in AWS "Standard Qualification Procedure".

C. Joint Welding Testing: Submit to Designer, in accordance with requirements of Section 01300, prior to start of fabrication, non-destructive testing method to be used for specific typical joints. Results of such tests during the course of work shall, upon request by Designer, be made available for review by Designer and/or Testing Agency.

D. Method of Erection: Submit to Designer, in accordance with requirements of Contract Documents, prior to starting work, description of methods, sequence of erection, and type of equipment proposed for use in erecting structural steel work. This submission shall not relieve Contractor of his responsibility for providing proper methods, equipment, workmanship, and safety precautions.

E. Shop Drawings: Submit to Designer, in accordance with requirements of Section 01300, detailed Shop Drawings, including erection drawings, schedules and index sheets showing: grades of steel; identification mark of members; dimensions; size, arrangement, and weight of members; orientation and relation of members to appropriate grid lines; setting elevations for column bases; framing to support metal deck; location and size of openings, slots, and holes; requirements, such as punched or drilled holes, for attachment of other materials or parts of construction; type, size, and extent of welds; joint welding procedures; welding sequences (use welding symbols adopted by American Welding Society); cleaning requirements prior to painting; type and dry thickness of paint. Members to be galvanized shall be so noted on shop drawings.

1. Except as otherwise noted, approval of Shop Drawings will be for size and arrangement of components. Errors in dimensions shown on Shop Drawings shall be responsibility of Contractor. Check and coordinate structural steel work with work of other trades before submitting Shop Drawings.

2. Do not proceed with fabrication of material or performance of work until corresponding item on Shop Drawing has been approved by Designer.

F. Connection Design Calculations: Submit to Designer, in accordance with requirements of Section 01300, complete design calculations, properly coordinated with Shop Drawings.

G. Mill Test Certification: Submit to Designer, in accordance with requirements of Section 01300, prior to delivery of structural steel to job site, triplicate copies of certified mill test reports of structural steel (including names and locations of mills and shops, and analyses of chemical and physical properties), properly correlated to structural steel to be used in this project.

H. Connection Material Certification: Submit to Designer in accordance with requirements of Section 01300, triplicate copies of manufacturer's certification of bolts, nuts, washers, and filler metal for welding.

I. Galvanizing Certification: Submit to Designer, in accordance with requirements of Section 01300, triplicate copies of certification stating that requirements pertaining to pre-galvanizing cleaning and galvanizing of steel have been performed in accordance with Contract Documents.

J. Samples: Submit to Designer, on request by Designer, and in accordance with requirements of Section 01300, samples and/or descriptive literature of materials, products and methods.

   1. Do not proceed with fabrication of material/product or performance of work until sample has been approved by Designer.

   2. Galvanizing shall be spot checked by Preece Test Method per ASTM A239, 10 cycles minimum.

K. Corrective Work: Submit to Designer, in accordance with requirements of Section 01300, drawings showing details of proposed corrective work prior to performing corrective work.

L. Affidavit: Submit to Designer, on request by Designer, manufacturer's and/or fabricator's and/or erector's affidavit stating that material or product provided complies with Contract Documents.

M. Maintain records of shop and field welding procedures and records of welders employed, date of qualification and identification symbol or mark. Maintain records for each impact wrench used in shop and field, showing dates, sizes of bolts tested and the corresponding torque values. Certified copies of the records shall be made available to Contractor, Designer and Owner's testing laboratory.

N. Submit complete shop details, keyed to erection layouts, and technical data for all structural bearings specified or shown.

O. Provide setting drawings, templates, and directions for the installation of anchor bolts, or other items to be installed by others. Verify proper installation of same.

P. Items requiring field measuring shall have all dimensions verified in the field before fabrication. Field dimensions shall be shown on the Shop Drawings and shall be noted as having been verified in the field.

1.6 INSPECTION, TESTING AND QUALITY CONTROL

A. Inspection and testing of structural steel fabrication and erection will be performed by an independent Testing Agency, under a separate contract with the Owner. Materials and workmanship shall be subjected to inspection and testing in mill, shop and/or field by Designer and/or Testing Agency. Such inspection and testing shall not relieve Contractor of his responsibility to provide his own inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.

B. Contractor shall maintain his own inspection and quality control of shop and field work.

C. Notify Designer and Testing Agency prior to start of any fabrication, erection, or other phases of work so as to afford them reasonable opportunity to inspect work.

D. Facilitate inspection and testing by Testing Agency. Contractor shall, at his own expense, furnish Testing Agency, upon request, with:

1. Complete sets of approved Shop Drawings and corrective work procedures at fabricating shop(s) and in field.

2. Cutting lists, order lists, material bills, and shipping lists.

3. Information as to time and place of all rolling and shipments of material to shops and field.

4. Representative sample pieces requested for testing.

5. Full and ample means and assistance for testing materials, and proper facilities for inspection of work, in mill, shop and field.

E. The inspector will perform his duties, when possible, in such a way that fabrication and erection are not unnecessarily delayed or impeded, and as follows:

1. The inspector will make all tests and inspections as

required by "Structural Welding Code".

2. The edges of the material to be welded will be ultrasonically examined for evidence of laminations, inclusions or other discontinuities. The extent to which such defects will be permitted and the extent of repair permitted shall be determined by the inspector and made in accordance with ASTM A6, Paragraph 9. Repairs made by welding shall be done in compliance with the requirements in "Structural Welding Code" and the accepted welding procedures.

3. 10% of all bolted connections and at least 2 bolts per connection shall be tested for proper torque in the bolts. At least 20% of all filet welds shall be tested with the magnetic particles and 100% of such welds shall be inspected visually. 100% of full penetration welds shall be inspected by ultrasonic testing.

4. Ultrasonic inspection will be performed in accordance with Section 6, Part C of the "Structural Welding Code"

5. Where inspection reveals defects, the extent of inspection will be increased as much as necessary to assure that the full extent of the defects in a joint has been found and to assure that the same defects are not present in the welds made on similar parts or under similar circumstances.

6. Work that is not acceptable will be designated by "Repair" or "Reject", as applicable.

7. Shop welds will be inspected in the shop before the work is painted or approved for shipment.

8. The inspector will maintain a daily record of the work he has performed and its disposition. Reports of these tests will be made in the form prescribed in the "Structural Welding Code". One copy of each of the reports will be submitted to the Architect on a weekly basis.

9. The inspector will make all tests and inspections of high-strength bolt connections as required by AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts".

F. Do not remove any marks or tags applied by Testing Agency identifying rejected work.

G. Any work found deficient shall be corrected or replaced in accordance with these specifications. Deficient welds shall be cut out to sound material and rewelded. Deficient assemblies shall be taken apart, corrected and reassembled, using new materials as required. A490 bolts shall not be reused. A325 bolts may be retightened once only.

H. Structural steel work which has been rejected by Designer and/or Testing Agency in mill, shop, or field, shall be corrected without delay and at no expense to the Owner.

I. The fact that steel work has been accepted at the shop shall not prevent its final rejection at the job site, or even after it has been erected, if it is found to be defective in any way.

J. Qualifications for Welding Work:

1. Qualify welding processes and welding operators in accordance with the latest edition AWS "Standard Qualification Procedure".

2. Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous 12 months and have been welding regularly.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide positive identification for each steel type and tensile strength classification, except A36 steel, by a uniform marking system on each piece. All steel shall be newly rolled steel.

2.2 STEEL MATERIALS

A. High strength carbon steel (high strength low alloy steel) - shapes, plate and bar shapes, ASTM A572 Grade 50 (Fy= 50 ksi).

B. Carbon steel - shapes, plate and bar shapes as specified on Drawings, ASTM A36 (Fy = 36 ksi).

C. Tubing, ASTM A500 Grade B (Fy = 46 ksi).

D. Anchor Bolts: ASTM A307 or ASTM A490.

E. High Strength Bolts: ASTM A325.

F. Filler Metal for Welding: E70XX low hydrogen as per Table 1.5.3 and 1.17.2 of AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", latest edition and in accordance with "Specification for Architecturally Exposed Structural Steel", latest edition.

G. Shear Connectors: Headed studs conforming to ASTM A108, Grades 1015-1020, minimum yield point of 50,000 psi, and minimum tensile strength of 60,000 psi.

H. Galvanizing: Hot dip galvanize any steel exposed to the weather and any other designated steel after fabrication in compliance with ASTM A123. All hot-dip galvanized steel shall be inspected for compliance with ASTM A123 and shall be marked with a stamp that indicates that ASTM number of ounces of zinc per square foot of surface. After galvanizing, steel shall be dipped in a 0.2 percent chromic acid solution. A notarized Certificate of Compliance with all of the above will be required from the galvanizer. Galvanizing shall be spot checked by Preece Test Method per ASTM A239.

I. Coating for Finished Bearing Surfaces (e.g., columns): "Magnafilm 1043" by Magnus Chemical Co., Garwood, N.J.; "M-2658, Blue Lacquer" by U.S. Steel Corp., Pittsburgh, PA or approved equal.

J. Painting: Refer to the drawings for steel designated to be painted. Paint designated structural steel after fabrication in accordance with specification and in accordance with "Specification for Architecturally Exposed Structural Steel".

PART 3 EXECUTION

3.1 INSPECTION

A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

3.2 HANDLING AND STORAGE

A. Handle and stack materials carefully to prevent deformation or damage. Store structural steel carefully on substantial timbers and blocking, so arranged that steel will be free from earth and properly drained, preventing any splattering with dirt or accumulation of water in or about steel. Take care to prevent damage to any shop painted surfaces and to prevent accumulation of mud, dirt, or other foreign matter on steel. Any accumulation shall be completely removed prior to erection.

3.3 FABRICATION

A. Except as otherwise indicated on Drawings or specified herein, fabricate structural steel in accordance with "STANDARDS" in this Section.

B. Permissible tolerances for steel members shall conform to ASTM A6. The as-fabricated tolerances shall conform to the cited AISC Specifications, AISC Code, AISC requirements for Architecturally Exposed Structural Steel and the AWS Code, except where closer tolerances and straightness of members are required for fitting of the work in fabrication or erection.

C. Provision for attachment of other materials: Punch and drill steel for attachment of other materials indicated on Drawings or noted in Specifications to be attached to steel.

D. The Contractor shall design and detail all connections required to resist the loads and reactions shown on the Drawings as specified. Fabrication and erection details shall supplement and be consistent with details shown on the Drawings. Do not use one-sided or other eccentric connections, except in isolated cases where they are specifically shown on Drawings.

E. Welding:

1. Provide quality control and qualification of welders and welding procedures and operations as specified under "Inspection, Testing, and Quality Control" in this Section.

2. Shop Welding Process: Use shielded metal-arc, submerged arc, gas metal-arc, and flux cored-arc, or other process approved by Designer.

3. Groove Welds: Provide complete penetration unless otherwise noted on Drawings.

4. Base metal shall be checked by Contractor to insure absence of laminations or other defects. Welds shall be sound throughout and have no cracks or imperfections.

5. Where structural joints are required to be welded,

details of joints, technique of welding employed, appearance and quality of welds made, and methods used in correcting defective work shall conform to applicable requirements noted under "STANDARDS" in this Section.

6. Prepare joint welding procedures and program of welding sequence (for each component and for welding joining components to each other) and submit to Designer for approval before any welding is done. After approval, welding procedures and sequences shall be followed without deviation unless specific approval for change is obtained from Designer. Designer may require requalification of these welding procedures by tests prescribed in AWS "Standard Qualification Procedure".

7. Each welder working on the project shall be assigned an identification symbol or mark. Each welder shall mark or stamp his identification symbol at each weldment completed, whether in shop or field.

F. Manual oxygen cutting shall be done only with a mechanically guided torch, except as permitted below.

1. Gas cut edges which are not welded and will be free of substantial stresses, as determined by the Designer, may be cut manually with an unguided torch provided that specified AISC edge distances to holes are maintained.

2. Gas cut edges which will be subjected to substantial stress (over one-half the allowable stress), as determined by the Designer, or which are to be welded may be cut manually with an unguided torch to a line not within 1/8 inch of the finished dimension, with final removal of material completed by chipping or grinding to produce a surface quality equal to that of the base metal edges.

G. Openings in Structural Steel: Cutting of openings differing from or in addition to those shown on approved shop drawings will not be permitted without written approval of Designer.

H. Corrective Work: Structural steel elements having fabrication errors and/or which do not satisfy tolerance limits shall not be incorporated in finished work. Such elements may be corrected if permitted by Designer and/or Testing Agency. Submit to Designer drawings showing details of proposed corrective work. These drawings shall be approved by Designer prior to performing corrective work. Corrective work shall be performed in accordance with requirements of Contract Documents. Corrective work and any retesting which may be required shall be at Contractor's expense.

1. Identification: Structural steel members shall have an assigned position and identification mark or symbol, clearly indicated on each piece near one end. Marks shall correspond to that given on Shop Drawings and erection drawings related to specific members.

3.4 STEEL SURFACE TREATMENTS

A. Unless indicated otherwise, structural steel beams, girders, and columns are to be left unpainted. Clean unpainted steel surfaces in accordance with SSPC-SP3.

B. Steel plates and angles supporting building facade shall be galvanized or painted in conformance with the requirements of Specification Section 09901 "PAINTING".

C. Steel facade lintels shall be galvanized to meet the requirements of Paragraph 2.02.G.

3.5 GALVANIZING

A. Hot-dip galvanize designated structural steel items after fabrication. Galvanizer shall stamp galvanized steel items indicating ASTM number and weight of zinc in ounces per square foot.

3.6 SHEAR CONNECTOR WELDING REQUIREMENTS

A. Testing Agency shall conduct test welding procedure for welding of shear connectors.

B. Shear connectors (studs) shall be applied in accordance with manufacturer's printed instructions. Use only personnel, methods and equipment authorized by manufacturer.

C. Check shear connectors for indications of insufficient and improper welds.

1. Less than 360 degree fillet for headed studs.

2. Burn-off (reduction in length after welding) less than 1/8 inch.

3. Cold appearance of weld.

D. If, after welding of any headed stud shear connector, visual inspection indicates any imperfections listed above or any other questionable appearance, such shear connector shall be struck hard with three-pound hammer and bent 15 degrees off perpendicular to beam and toward nearest end of beam. Shear connectors meeting this test shall be considered acceptable and left in this position. Shear connectors failing under this test shall be replaced.

E. Personnel welding shear connectors shall be qualified using elements of above procedure, prior to any production welding of shear connectors.

3.7 ERECTION

A. Except as otherwise indicated on Drawings or specified herein, erect structural steel in accordance with "STANDARDS" in this Section.

B. Methods of Erection: Prior to starting work submit to Designer description of methods, sequence of erection, and type of equipment proposed for use for erecting structural steel work. This submission, and approval of same by Designer, shall not relieve Contractor of his responsibility for providing proper methods, equipment, workmanship, or safety precautions.

C. Provide temporary flooring, planking, and scaffolding necessary in connection with erection of structural steel or support of erection machinery. Temporary floors shall be as required by Massachusetts state laws governing safety regulations, and O.S.H.A. requirements.

D. Field Connections (unless otherwise indicated): Use welded or high strength bolts installed by "modified turn-of-nut method". Beams shall have framed connections using 3/4 inch diameter (min.) high strength bolts in accordance with requirements of AISC "Manual of Steel Construction" and Contract Documents. Do not use one-sided or other eccentric connections, except in isolated cases where approval of Designer is obtained.

E. Errors in shop fabrication or deformations resulting from handling and/or transportation that prevent proper assembly and fitting of parts shall be reported immediately to Designer for approval of method of correction. Approved corrections shall be made at Contractor's expense.

F. Furnish templates and anchor bolts and instructions for setting of anchor bolts and other items to be embedded in cast-in-place concrete, in ample time so that this work will not be delayed.

G. Setting Plates: Set base plates level to correct elevations and support temporarily on steel wedges, shims, leveling devices, or as shown on Drawings, until corresponding supported member has been positioned, plumbed and anchor-bolted. Entire area under plates shall then be packed solidly with non-shrink grout. Leave protruding leveling devices in place until after grout has attained required strength, and then cut off flush with top or edges of base plates, or both, except as otherwise noted.

H. Align, level, and adjust members accurately prior to final fastening. Fasten compression member splices only after abutting surfaces have been brought completely into contact.

I. As erection progresses connect work securely and introduce temporary bracing wherever necessary. Leave such bracing in place as long as may be required for safety.

J. High Strength Steel Bolts

1. Bolt length shall provide at least two full threads beyond nut after tightening. Provide bearing-type connections only where shown; all other bolted connections shall be slip-critical type.

2. Perform installation by using pneumatic powered impact wrenches with sufficient capacity and adequate supply of compressed air.

3. Perform installation in accordance with turn-of-nut method outlined in RCRBSJ "Specification for Structural Joints Using ASTM A325 or A490 Bolts", with modifications noted below.

   a. Use hardened washer under bolt head or nut, whichever is turned in tightening, unless oversize holes have been approved which require such washer under both head and nut. Use not more than two washers.

   b. Qualification of high strength bolting procedures and operations shall be as specified under "Inspection, Testing and Quality Control", in this Section.

   c. Refer to this bolting installation method as "Modified Turn-of-nut Tightening Method".

4. Make joints without use of erection bolts; high strength bolts required for joint shall serve that purpose.

5. Correct poor matching of holes by drilling to next larger size and using larger size bolt, if approved by Designer. Welding for redrilling will not be permitted.

6. If top flange plates are used at girder moment connections, bolts at top flange plate shall be oriented nut-end down.

K. Top flanges of beams to receive shear connectors, shall be free of paint, water, dirt, rust, or any other material detrimental to welding.

L. Field Welding: Execute in accordance with requirements under "FABRICATION" in this Section, excepting those requirements which manifestly apply to shop conditions only.

M. Field Oxygen Cutting: Not to be performed without written consent of Designer. Once approval is obtained, execute in accordance with requirements under "FABRICATION" in this Section.

N. Openings in structural steel required in field:

1. Make no openings without the specific written approval of the Designer. All re-entrant corners shall be shaped notch-free to a radius of at least 1/2 inch at blocks, copes, cuts and openings.

2. Openings in structural steel shall be cut and/or reinforced only by structural steel Contractor, and only with specific prior written approval of the Designer.

END OF SECTION

SECTION 05210 - STEEL JOISTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, and services required to complete steel joist work shown on Drawings, as specified herein, or both, including but not limited to items noted below.

1. Provide all steel joists, standard open web design in "K" series and VS Series joist substitutes shown on Drawings.

2. Perform shop painting and field touch up of joists, joist substitutes, and accompanying metal parts.

3. Provide connections, bridging, bracing, structural welded shapes for headers, extension members, tapered bearing end, beams and other incidental items necessary and/or required to complete the work.

4. Provide reinforcing members in webs of joists as may be required to support mechanical equipment.

5. Unless specifically excluded, furnishing and installation of any other items of steel joist work indicated on Drawings, specified, or obviously needed to make work of this Section complete.

B. Related Work Specified Elsewhere:

1. Cast-in-Place Concrete

2. Masonry

3. Structural Steel

4. Metal Decking

5. Light Metal Framing

1.3 QUALITY ASSURANCE

A. All units shall be furnished by a member, in good standing, of the Steel Joist Institute, and further;.

B. All open web steel joist work shall be in accordance with the Standard Specifications for Steel Joists of the Steel Joist Institute (SJI).

C. The Contractor shall submit conclusive evidence of having satisfactorily completed work of similar scope and of having the necessary skill, equipment, facilities and capacity to fabricate and to perform the erection in accordance with the construction schedules and in full compliance with all requirements of the Contract Documents.

1.4 STANDARDS

A. Except as otherwise specified herein, perform work in accordance with specifications noted below, including latest editions of applicable specifications, codes, and standards cited therein, and latest applicable addenda and supplements. Copies of these items shall be kept available in shop and field.

1. "The Commonwealth of Massachusetts State Building Code", latest edition.
2. "Specification for the Design of Cold-Formed Steel Structural Members", American Iron and Steel Institute.
3. "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design", American Institute of Steel Construction, 1989.
4. "Code for Welding in Building Construction (AWS D1.1)", American Welding Society, latest edition.
5. "Painting Manual, Vol. 1, Good Painting Practice" and "Painting Manual, Vol. 2, Systems and Specifications", Steel Structures Painting Council.
6. "Standard Specification, Load Tables and Weight Tables for Steel Joists and Joist Girders "K" Series", Steel Joist Institute.

B. Any material or operation specified by reference to published specifications of manufacturer or published standard shall comply with said specification or standard. In case of conflict between referenced specifications, most stringent requirement shall govern. In case of conflict between referenced specifications and Project Specifications, Project Specifications shall govern.

1.5 SUBSTITUTIONS

A. Substitutions for steel joist sizes, type, connection details or any other modifications proposed by Contractor will be considered by Designer only under following conditions:

1. That request has been made and accepted prior to submission of Shop Drawings.
2. That there is a substantial cost advantage or time advantage to Owner; or that proposed revision is necessary to obtain required materials or methods at proper times to accomplish work in time scheduled.
3. That sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by Designer, including cost reductions or savings in time to complete work.
4. That the cost of reviewing the substitutions shall be borne entirely by the Contractor.

1.6 SUBMITTALS

A. Shop Drawings indicating joist sizes, types, configurations, panel spacing, member sizes, bridging size and location, methods of attachment and all accessories as may be required for the proper installation of joists.

B. Joist manufacturer shall submit an affidavit with the first submittal of Shop Drawings stating that the manufacturer's current design has been submitted and checked by the SJI and found to conform to their standard specification.

C. Product data for shop priming materials.

D. Certification of Specification Compliance.

E. Manufacturers Material Safety Data Sheet (MSDS) must be submitted for each product.

1.7 REQUIREMENTS AND RESTRICTIONS

A. Bridging: Comply with reference standard specifications and structural drawings for size, spacing and anchorage requirements; most stringent requirements must govern.

B. End Conditions shall be as follows:

1. Joists on column center line - to be attached to column as detailed.
2. Joists resting on steel beams - to be welded to beams.
3. Extend top and bottom chords as shown and/or required to

provide positive attachment to structure or for applied construction.

4. Minimum bearings: 4 inches on steel beams or as dictated by joist series employed and/or detailed.

5. Taper bearing ends of all sloping joists.

1.8 DELIVERY AND STORAGE OF MATERIALS

A. The Contractor shall deliver to the site all materials required to complete the work properly and shall have the necessary competent work persons on the site to receive and handle materials.

B. Before and during erection, all material shall be kept clean, stored and handled in such a manner as to avoid injury in any way. Each piece shall be placed so that water cannot stand thereon, nor shall any piece bend under its own or superimposed weights or from any other cause that may injure it. Any piece showing effect of rough handling will be rejected and removed from the site.

C. Joists and/or joist substitutes damaged so as to cause rejection by the Architect and/or the Designer shall be repaired or replaced at the expense of the Contractor in a manner satisfactory to the Architect and/or the Designer. Expense of repairs shall include certification as to structural adequacy by a licensed professional structural engineer engaged by the Contractor expressly for this purpose.

1.9 INSPECTION, TESTING AND QUALITY CONTROL

A. Inspection and testing of steel bar joists and erection will be performed by an independent Testing Agency under a separate contract with the Owner. Materials and workmanship shall be subjected to inspection and testing in the mill. shop and/or field by Designer or Testing Agency. Such inspection shall not relieve Contractor of his responsibility to provide his own inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.

B. Contractor shall maintain his own inspection and quality control of shop and field work.

C. Notify Designer and Testing Agency prior to start of any fabrication, erection, or other phases of work so as to afford them reasonable opportunity to inspect work.

D. Facilitate inspection and testing by Testing Agency. Contractor shall at his own expense, furnish Testing Agency, upon request, with:

1. Complete sets of approved shop drawings and corrective work procedures at fabricating shops and in the field.
2. Cutting lists, order lists, material bills, and shipping lists.
3. Information as to time and place of all rolling and shipments of material to shops and field.
4. Representative sample pieces requested for testing.
5. Full and ample means and assistance for testing materials, and proper facilities for inspection of work, in mill, shop and field.

E. The inspector will perform his duties in such a way that fabrication and erection are not unnecessarily delayed or impeded, and as follows:

1. The inspector will make all tests and inspections as required by "Steel Joist Institute".
2. 10% of all bolted connections and at least 1 bolt per connection shall be tested for proper torque. At least 20% of all filet welds shall be tested with magnetic particles and 100% of such welds shall be inspected visually.
3. Work that is not acceptable will be designated by "Repair" or "Reject", as applicable.
4. Shop welds will be inspected in the shop before the work is painted or approved for shipment.
5. The inspector will maintain a daily record of the work he has performed and its disposition. One copy of these reports will be submitted to the Architect on a weekly basis.

F. Do not remove any marks or tags applied by Testing Agency identifying rejected work.

G. Any work found deficient shall be corrected or replaced in accordance with these specifications. Deficient welds shall be cut out to sound material and rewelded. Deficient assemblies shall be taken apart, corrected and reassembled, using new materials as required.

H. Any work which has been rejected by the Designer and/or

Testing Agency in mill, shop, or field, shall be corrected without delay and at no expense to the Owner.

J. Qualifications for welding work:

1. Qualify welding processes and welding operators in accordance with the latest edition AWS "Standard Qualification Procedure".

2. Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous 12 months and have been welding regularly.

PART 2 PRODUCTS

2.1 Steel materials used for the fabrication of joist systems shall be as specified within the Reference Standard for the particular system and/or as shown on structural drawings.

2.2 PAINTING

A. The standard shop paint shall conform to one of the following:

1. SSPC Specification 16-68, Type I

2. Federal Specification TT-P-638.

3. or, shall be a shop paint which meets the minimum performance requirements of one of the above listed specifications.

   Material shall be as manufactured by Tnemec; DuPont; Glidden; Devoe; Rust-Oleum or Sherwin-Williams.

B. All materials shall be delivered in original sealed containers with identifying brand, number and name and shall be used without any admixture.

C. Clean steel of scale, rust oil, moisture and dirt before applying shop paint.

D. Apply one shop coat after fabrication to thickness as recommended by the manufacturer of the coating and/or SSPC requirements governing such coating material. Paint all joists.

2.3 FABRICATION

A. Meet applicable requirements of SJI, AISC and ASTM for types of bar joists indicated.

B. Completely fabricate joists in shop.

C. Steel joists may be fabricated from hot or cold formed sections, strip or sheet steel, welded together.

D. Joint members along lines of centers of gravity of sections or increase size to allow for eccentricity.

E. Manufacture and fabricate joists to suit requirements indicated, including extended chords, camber, slope, anchorage and bearing.

F. Assume responsibility for dimensions and fit.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

3.2 ERECTION

A. Joists shall have a minimum bearing of four (4) inches or as noted on the drawings.

B. Anchor each joist on steel members with continuous welds or bolting as shown and/or specified herein. Welding shall conform with the best practices as recommended in the AWS code.

C. Cutting away of flanges or web sections of joists during any portion of construction is prohibited.

D. Joists shall be set in designated locations, true to lines and levels indicated on drawings, placed straight and parallel.

E. Joists shall be permanently bridged and fastened before subjecting the panel to construction or other loads. Caution shall be exercised to prevent undue load concentrations.

3.3 PAINTING

A. Immediately following erection of all joists and accompanying metal parts, retouch any scraped, rusted, abraded, erection marks, and unpainted surfaces with same material as used for shop coat.

B. Painting specified herein does not count as a coat for finish painting. Finish coating shall be as specified in Section 09900 where required by schedules.

END OF SECTION

SECTION 05300 - METAL DECKING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, and services required to complete metal deck work shown on Drawings, as specified herein, or both, including but not limited to items noted below.

1. 9/16 inch deep metal form deck.
2. 3 inch deep galvanized composite metal floor deck.
3. 1-1/2 inch deep Type "B" painted roof deck.
4. Shear connectors required for structural steel composite beams.
5. Drainage and roof sump pans.
6. Metal deck accessories: closures, transition plates, welding washers, stoppers and cover plates.
7. Miscellaneous structural framing and connections for support of metal deck where required and not provided under structural steel framing Section.
8. Cutting of holes and openings in metal deck in accordance with requirements under "ERECTION" in this Section.
9. Furnishing and application of approved field touch-up paint for scarred metal deck.
10. Coordination of any "additional" reinforcing steel requirements.
11. Furnishing of partition/deck closure pieces mated to deck system so chosen.
12. Furnishing of metal deck items, required to be built into or form part of work specified under other Sections, to appropriate trade at proper time with complete

instructions to facilitate installation.

13. Unless specifically excluded, furnishing and installation of any other items of metal deck work indicated on Drawings, specified, or obviously needed to make work of this Section complete.

B. Related Work Specified Elsewhere:

1. Cast-in-Place Concrete
2. Masonry
3. Structural Steel
4. Steel Joists
5. Light Metal Framing
6. Painting

1.3 STANDARDS

A. Except as otherwise specified herein, perform work in accordance with specifications noted below, including latest editions of applicable specifications, codes, and standards cited therein, and latest applicable addenda and supplements. Copies of these items shall be kept available in shop and field.

1. "The Commonwealth of Massachusetts State Building Code", latest edition.
2. "Specification for the Design of Cold-Formed Steel Structural Members", American Iron and Steel Institute.
3. "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design", American Institute of Steel Construction, 1989.
4. "Code for Welding in Building Construction (AWS D1.1)", American Welding Society.
5. "Painting Manual, Vol. 1, Good Painting Practice" and "Painting Manual, Vol. 2, Systems and Specifications", Steel Structures Painting Council.
6. SDI: "Code of Recommended Standard Practice".

B. Any material or operation specified by reference to published specifications of manufacturer or published standard shall comply with said specification or standard. In case of conflict between referenced specifications, most stringent requirement shall govern. In case of conflict between referenced specifications and Project Specifications, Project Specifications shall govern.

1.4 SUBSTITUTIONS

A. Substitutions for metal deck sizes, type, connection details or any other modifications proposed by Contractor will be considered by Designer only under following conditions:

1. That request has been made and accepted prior to submission of Shop Drawings.
2. That there is a substantial cost advantage or time advantage to Owner; or that proposed revision is necessary to obtain required materials or methods at proper times to accomplish work in time scheduled.
3. That sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by Designer, including cost reductions or savings in time to complete work.
4. That the cost of reviewing the substitutions by the Designer shall be borne entirely by the Contractor.

1.5 SUBMITTALS

A. Fire Rating Certification: Submit to Designer, in accordance with requirements of Section 01300, documentation and certification that composite metal deck as part of proposed structural system will qualify for the fire ratings specified on the drawings prior to submitting detailed Shop Drawings.

B. Job Standards: Submit to Designer, in accordance with requirements of Section 01300, "job standard" metal deck details proposed prior to submitting detailed Shop Drawings.

C. Methods of Erection: Submit to Designer, in accordance with requirements of Section 01300, prior to starting work, description of methods, sequence of erection, and type of equipment proposed for use in erecting metal deck. This submission shall not relieve Contractor of responsibility for providing proper methods, equipment, workmanship, and safety precautions.

D. Shop Drawings: Submit to Designer, in accordance with requirements of Contract Documents, detailed Shop Drawings, including erection drawings and schedules, properly cross-referenced, showing: metal deck type; gage; finish; layout; identification mark; location; openings; dimensions; anchorages; laps; conditions requiring closures; supplementary framing and special jointing or other accessories; number, size, capacity, and layout of shear connectors; location and size of welding and/or mechanical fastening; and welding data.

1. Except as otherwise noted, approval of Shop Drawings will be for size and arrangement of components. Errors in dimensions shown on Shop Drawings shall be responsibility of Contractor. Check and coordinate metal deck work with work of other trades before submitting Shop Drawings.

2. Do not proceed with fabrication of material or performance of work until corresponding item on Shop Drawing has been approved by Designer.

E. General Contractor shall obtain the necessary information from all other trades requiring openings through metal deck and shall show all such openings, properly dimensioned and drawn to scale on the metal deck shop drawings before the latter are submitted for approval.

F. Hanger Attachment Devices: Submit to Designer, in accordance with requirements of Section 01300, complete description, including certified load tests, of hanger attachment devices proposed for use in hanging suspended ceiling construction from concrete/metal deck slab system to be used in actual construction.

G. Samples: Submit to Designer, in accordance with requirements of Section 01300, samples and/or descriptive literature of materials, products, and methods as requested by Designer.

1. Do not proceed with fabrication of material/ product or performance of work until sample has been approved by Designer.

H. Corrective Work: Submit to Designer, in accordance with requirements of Section 01300, drawings showing details of proposed corrective work prior to performing corrective work.

I. Affidavit: Submit to Designer, on request by Designer, manufacturer's and/or fabricator's and/or erector's affidavit stating that material or product provided complies with Contract Documents.

1.6 INSPECTION, TESTING, AND QUALITY CONTROL

A. Inspection and testing of metal deck work will be performed by an independent Testing Agency, under a separate contract with the Owner. Materials and workmanship shall be subjected to inspection and testing in shop and field by Designer and/or Testing Agency. Such inspection and testing shall not relieve Contractor of responsibility to provide additional inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.

B. Notify Designer and Testing Agency prior to start of any fabrication, erection, or other phases of work so as to afford them reasonable opportunity to inspect work.

C. Facilitate inspection and testing by Testing Agency. Contractor shall, at no expense to the Commonwealth, furnish Testing Agency, upon request, with:

1. Complete sets of approved Shop Drawings and corrective work procedures at shop(s) and in field.
2. Cutting lists, order lists, material bills, and shipping lists.
3. Information as to time and place of all rollings and shipments of material to shop(s) and field.
4. Representative sample pieces requested for testing.
5. Full and ample means and assistance for testing materials, and proper facilities for inspection of work, shop and field.

D. Testing Agency shall inspect and test metal deck and shear connector work as required by Designer.

E. Maintain records of welders employed and date of qualification. Such records shall be available for examination by Designer and/or Testing Agency, or certified copies submitted upon request to Designer and Testing Agency.

F. Do not remove any marks or tags applied by Testing Agency identifying rejected work.

G. Metal deck work which has been rejected by Designer and/or Testing Agency in shop or field shall be corrected without delay and at no expense to the Owner.

H. If arrangements for corrections and/or replacements are not made within seven days after notice of rejection, the Owner shall have right to have corrections and/or replacement made and charge cost thereof against balance of monies withheld.

PART 2 PRODUCTS

2.1 GENERAL

A. Deck shall be listed by U.L., Inc., as "steel floor and form unit". Label and mark each bundle of deck, as required by U.L., Inc., indicating manufacturer, testing and inspection according to the above listings.

B. The material shall be furnished by a manufacturer having the indicated fire ratings, tested, listed, and approved by U.L., Inc., for the construction assemblies shown on the Drawings.

C. All composite metal deck floor units shall be formed with sufficient integral locking lugs to transfer the horizontal shearing forces between the concrete slab and the floor unit and to prevent vertical separation of the slab from the deck. Deck flute width shall be six inches wide.

D. Furnish deck in lengths to be continuous for three spans wherever possible, unless otherwise shown, and provide two inch minimum end bearing on the supporting members.

E. Fabricate all materials in accordance with the approved shop drawings.

2.2 MATERIALS

A. Metal Deck:

1. Fabricate of steel having a 33,000 psi minimum yield strength and conforming to ASTM A446.

2. All composite steel floor decks shall have a galvanized coating conforming to ASTM designation G60.

3. 1-1/2 inch deep roof deck shall have a shop applied two coat system of chromate primer and acrylic topcoat

applied over cleaned and phosphated steel.

B. Deck Accessories:

1. Fabricate deck accessories of 18 gage minimum sheet steel, with painted coating same as provided on metal deck. Provide the following typical accessories and any additional accessories required by deck manufacturer's metal deck system to provide continuous support for the concrete and to prevent loss of concrete fines through gaps and openings.

   a. Cover plates or flashing plates as required to close panel edge or end conditions and where panels change direction or abut.

   b. Horizontal flashing to close openings between metal deck and structural steel columns.

   c. Horizontal flashing to cover gaps between deck and structural steel or between deck units.

   d. Edge closures and screeds to provide boundary for concrete cast on metal deck. Unless a structural steel member is the edge form, provide edge forms at slab perimeter and at openings in slabs cast on metal deck. Edge closures and forms shall have (or shall be braced to have) sufficient strength and stiffness to retain the concrete with straight edges true to drawings details and dimensions. Edge closures shall not interfere with shear connector installation.

   e. Drain pans or sumps, flat or recessed to suit drains, formed of 14 gage galvanized steel.

   f. Welding washers - to be used where specified under Part 3 "INSTALLATION".

   g. Rust-inhibiting priming paint for touch-up: "Tnemec-Zinc 92" by Tnemec Co. or approved equal.

C. Welding materials: conform to AWS Code and AWS filler metal specifications.

D. Auxiliary Structural Steel:

1. Steel shapes and plates shall be new steel conforming to ASTM A36.

2. Fabrication shall conform to AISC Specification.

E. Shear Connectors: Headed steel studs with ceramic arc shield. Studs shall conform to "Specification for Cold-Finished Carbon Steel Bars and Shafting", ASTM A108, grades 1015, 1017, or 1020, minimum yield strength = 50,000 psi and minimum tensile strength = 60,000 psi. See AWS Code D1.1, Section 4, Part F "Stud Welding" for additional material requirements.

PART 3 INSTALLATION

3.1 INSPECTION

A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

3.2 GENERAL

A. Install all components in accordance with the Contract Documents and the approved Shop Drawings. Erect metal deck only after the supporting structural steel has been aligned and connected as required by the Structural Drawings and Specifications.

B. Handle and stack materials carefully in order to prevent deformation or damage. During unloading and hoisting, take care to prevent damage to ends and sides of individual deck panels. Panels stored prior to installation shall be placed on skids and shall be protected and kept dry. Foreign materials on panels shall be completely removed prior to erection.

C. Replace damaged components with identical new units, unless repair or reinforcement is specifically permitted by the Designer.

3.3 AUXILIARY STEEL SUPPORTS

A. Erect auxiliary steel supports in accordance with provisions of Section 05120 "Structural Steel" of the Specifications, and in conformance with the approved Shop Drawings.

B. Bearing surface of each auxiliary support shall be in the plane of the bottom of the deck, as established by adjacent structural steel members on which the deck is to bear.

3.4 METAL DECK

A. Metal deck panels shall be shipped to the field cut to the proper length. All notching at columns, bevel cuts, or other similar fabrication shall be done by the metal deck erector.

B. No opening shall be cut in metal deck unless shown on the approved metal deck Shop Drawing or specifically approved by the Designer in writing. If an opening not shown on the Shop Drawings is required, Contractor shall submit to the Designer a sketch drawn to scale, showing the proposed opening and all other openings and supports in the immediate area. The deck shall not be cut until this sketch has been approved by the Designer. Any additional reinforcement or framing required because of such an opening shall be provided at Contractor's expense.

C. Holes and openings which are located and dimensioned on the Structural Drawings shall be cut by the metal deck erector. Holes required by other trades shall be shown on the metal deck Shop Drawings but shall be located and cut by the respective trades.

D. All cutting of metal deck panels shall be done in a workmanlike fashion by power shears, gas-torch, cold chisel or other means approved by the Designer.

E. Surfaces of structural steel members which are to receive shear connectors, and metal deck support surfaces which are to receive welding or shear connectors, shall be free of paint, ice, water, oil, dirt, rust or any other material detrimental to welding.

F. Metal deck panels shall not be installed until the temporary shoring, where required, has been installed.

G. No metal deck shall be erected until the corresponding structural steel tier has been fully aligned and connected. If the supporting steel framework or concrete is not in proper alignment, or at the proper level, Contractor shall proceed with corrective action. The metal deck panels shall not be erected until the necessary corrections have been made.

H. Metal deck panels shall be placed on supporting steel or concrete and accurately aligned to final position before being permanently fastened. Deck shall not be stretched or contracted in a transverse direction and shall have a minimum end bearing of 2 inches on the supporting steel or concrete. Metal deck panels shall rest tightly on the top flange of beams or girders, or any other support surfaces. Unless indicated otherwise, all steel beams in floor/roof areas where metal deck is used shall have their top flanges in direct contract with and welded to the deck, for lateral stability of the beams.

I. Install sheet steel accessories welded in place, including closures, screeds, filler pieces, or cover plates, as appropriate, to close panel ends, where panels change direction or abut, to bridge from edges of panels to adjacent steel or concrete, at slab edges, and at other locations where shown or otherwise required to support and retain the concrete at each floor level.

J. Column closures shall be both cut and installed in the field.

K. All welding of metal deck panels, including accessories, shall be performed by welders who have been qualified by tests, as prescribed in the "Standard Qualification Procedure" of the American Welding Society.

L. Before any welding of the metal deck is done, two specimens of each type of weld shall be prepared by each operation. These specimens shall be inspected, tested, and approved by the Designer's representative before that operator shall be permitted to weld on the structure.

M. Burning or weakening of the metal deck material around welds shall be cause for rejection. Deficient welds shall either be repaired or entirely removed and rewelded or the metal deck shall be reinforced or replaced, as directed by the Designer.

N. Metal deck panels shall be arc-welded to the supporting steel in accordance with the following minimum requirements:

1. Welding washers of a type approved by the Designer shall be used in connecting any metal deck material less than 18 gage in thickness.

2. Ends and end laps - 3/4 inch diameter puddle welds at a maximum spacing across the width of the panel, of 12 inches.

3. Intermediate supports - same as (2) above.

4. Where two panels abut, each panel shall be fastened as in (2) above.

5. Longitudinal edges and edge laps supported by steel framework - 3/4 inch diameter puddle welds at a maximum spacing of 12 inches along the length of the panel.

6. See Drawings for additional requirements in special areas.

O. Longitudinal side laps of adjacent panels:

1. Deck shall be welded or mechanically fastened between supports at intervals not exceeding 2 feet.

P. Longitudinal edge closures shall be fastened by tack welding at a maximum spacing of 2 feet. Sheet metal screws shall not be used.

Q. Locate drain pans or sumps to suit drain fittings and drain locations. Cut deck to receive drain and weld in pan or sump to reinforce deck openings.

R. Both welding to bottom of metal deck and field penetration through metal deck for hangers or hanger attachment devices are prohibited

3.5 SHEAR CONNECTORS

A. Headed stud shear connectors shall be installed after erection of the metal deck, in accordance with the AWS Code, by experienced operators using automatic welding equipment, adequate electric power and ceramic shields, in accordance with the recommendations of the study manufacturer.

B. Through-deck stud welding shall be used where gage thickness permits proper stud welding to develop required strength. Stud and/or metal deck manufacturer shall provide adequate test results to verify feasibility of through-deck stud welding for particular stud size and gage thickness involved. Study and/or metal deck manufacturer shall satisfy requirements of stud installer for expeditious and proper installation. Manufacturer's requirements regarding cleanliness of steel and other items shall be met by installer.

C. If through-deck stud welding is unfeasible, studs shall be installed in prepunched holes in deck. Prepunched holes shall be provided only for studs involved and hole oversize shall be held to a minimum.

D. All shear connectors shall be headed steel studs.

E. Stud spacing - shall be in accordance with all spacing requirements of AISC. Space approximately uniformly between center (or designed zero shear point) of beam and each end or designated end point, or as otherwise shown.

F. Horizontal clearances - Minimum one inch from edge of any stud to face of concrete or deck rib.

G. Edge distance - Center of stud to edge of steel beam shall be preferably two inches, but in no case less than 1-1/4 inches.

H. All headed stud shear connectors shall be checked for the following indications of an insufficient weld:

1. Less than 360 degree fillet, voids, undercuts, or insufficient penetration.

2. Burn-off (reduction in length after welding) less than 1/8 inch.

3. Cold appearance of the weld.

I. If, after welding of any shear connectors, visual inspection indicates any of the imperfections listed above or any other questionable appearance, such stud shall be struck hard with a three-pound hammer and bent 15 degrees off perpendicular to beam and toward nearest end of beam. Studs which fail this test, as provided in the AWS Code, shall be replaced. Studs which show no sign of failure after this test may be left in bent position if no portion of the stud is less than one inch from a proposed concrete surface.

J. After stud installation in each area, all ceramic shields shall be broken off and the material removed from the deck and steel surfaces to an area designated by the General Contractor.

K. Personnel welding shear connectors shall be qualified using elements of above procedure, prior to any production welding of shear connectors.

END OF SECTION

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY:

A. Types of cold-formed metal framing units include C-shaped steel studs and runners for exterior wall framing.

B. Related Sections: The following sections contain requirements that relate to this Section:

   1. Steel stud framing for panelized EIFS walls is included in Section 07241, "Exterior Insulation and Finish Systems - Class PB".

C. Work Specified Elsewhere:

   1. Steel framing systems 20 gage and lighter for interior framing to receive gypsum boards is included in Section 09250, "Gypsum Drywall".

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. General: Provide steel stud framing assemblies fabricated and installed that comply with performance requirements specified.

   1. Use connection methods between members designed to perform as specified under indicated loading.
   2. Install additional anchorages, bracing, and joint reinforcing to manufacturer's stock units as required to make installed framing assembly comply with specified requirements.

B. Structural Performance: Provide steel stud framing assemblies with no failure or permanent deflection exceeding 1/600 of any member's span after removal of imposed load, or any deflection exceeding 1/360 of any member's span under imposed load for the following pressures:

   1. Framing assemblies less than 40 feet above finish grade to centerline of wall: Positive (inward) and negative

(outward) pressure of 21 lbs per sq. ft.

2. Framing assemblies more than 40 feet above finish grade to centerline of wall: Positive (inward) and negative (outward) pressure of 31 lbs per sq. ft.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data and installation instructions for each item of cold-formed metal framing and accessories.

B. Shop drawings for prefabricated panels indicating the following:

1. Placing drawings for panel assemblies showing size and gage desinations, type, and spacing of members. Include supplemental strapping, bridging, and reinforcement, and connection details between members.
2. Details indicating method of panel attachment to substrate and structural framing for proper installation.
3. Include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer, licensed to practice in Massachusetts, who was responsible for their preparation indicating that installed panel assemblies comply with specified design loadings,

1.5 QUALITY ASSURANCE:

A. Component Design: Calculate structural properties of studs in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members."

B. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel".

C. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units that have been approved by governing authorities that have jurisdiction.

1.6 PROJECT CONDITIONS:

A. Field Measurements: Where steel stud framing assemblies are to be prefabricated into panels, check actual dimensions of substrate construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule to with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

   1. Dale Industries, Inc.
   2. Dietrich Industries, Inc.
   3. Gold Bond Building Products Div., National Gypsum Co.
   4. Marino Industries, Inc.
   5. Superior Steel Studs, Inc.
   6. USG Industries
   7. United States Steel

2.2 METAL FRAMING:

A. System Components: Manufacturers' standard load-bearing steel studs of type, size, shape, and gage as indicated. With each type of metal framing required, provide manufacturer's standard, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.

B. Materials and Finishes:

   1. For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.
   2. For 18-gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.
   3. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.

      a. Finish of installation accessories to match that of main framing components, unless otherwise indicated.

   4. Fasteners: Provide nuts, bolts, washers, screws and

other fasteners with corrosion-resistant plated finish.
5. Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.
6. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.3 PANEL FABRICATION:

A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded.

  1. Fabricate panels with lifting points and bracing designed to prevent distortion or damage during moving or installation.

B. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.

  1. Fabricate panels with shop-applied anchorages welded in place. Reinforce members at connection points as required.

C. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.

D. Wire tying of framing components is not permitted.

E. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations and as indicated.

B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches o.c. spacing for power-driven fasteners or 16 inches o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.

1. Provide slip joint track at wall top or other connection method as indicated or required to prevent axial structural loads from being transfered to stud framing system.

C. Installation of Wall Studs: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.

D. Set studs plumb, except as needed for diagonal bracing or other similar requirements.

E. Where stud system abuts structural columns or floors, anchor ends of stiffeners to supporting structure.

F. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

G. Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

H. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

I. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 54 inches o.c. Weld at each intersection.

J. Erection Tolerances: Screw fasten or weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true-to-line joints.

3.2 FABRICATED PANEL INSTALLATION:

A. Install panel assemblies plumb, true to line, square and level, using temporary and permanent shims to place and secure at proper locations.

1. Handle and lift panels to avoid distortion, racking, or

damage. Temporarily secure until final levelling and truing can be performed.

2. Maintain indicated joint widths and tolerances between panels.
3. Do not force panels into position. Remove and modify as required to fit in proper position.

B. Weld anchorages to building structure as indicated, making provisions for deflection and movement.

   1. Provide slip joint at assembly top or other connection method as indicated or required to prevent axial structural loads from being transfered to panel assembly.

C. Erection Tolerances: Weld wall panels in place to produce flush, even, true-to-line joints.

   1. Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16 inch.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY:

A. This section includes the following metal fabrications:

1. Ladders.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Miscellaneous framing and supports for applications where framing and supports are not specified in other sections.
5. Miscellaneous steel sections and trim.
6. Steel pipe railings.
7. Metal stairs.
8. Exterior metal gates and railings.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 05120, "Structural Steel", for structural steel components.
2. Section 08710, "Door Hardware", for operating hardware installed in gate assemblies.
3. Section 09900, "Painting", for field applied paint systems over primers indicated in this Section.

C. Items furnished under this Section for installation by others included the following:

1. Miscellaneous anchorages, nosings, and supports for embedment in cast-in-place concrete or unit masonry.

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the indicated structural loads, complying with the Massachusetts State Building Code, without exceeding the allowable design working stress of the materials involved, including anchors and connections:

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
    a. Concentrated load of 200 lbs applied at any point nonconcurrently, vertically downward, or horizontally.
    b. Uniform load of 100 lbs per linear ft. applied nonconcurrently, vertically downward or horizontally.
    c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
    a. Concentrated load of 200 lb applied at any point nonconcurrently, vertically downward or horizontally.
    b. Uniform load of 50 lbs per linear ft. applied nonconcurrently, vertically downward or horizontally.
    c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lb applied to one sq. ft. at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.
4. Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lb per sq. ft. or a concentrated load of 300 lb on a area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.
5. Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lb per sq. ft.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for products used in miscellaneous metal fabrications, including paint products and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1. Where installed metal fabrications are indicated to

comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.

D. Samples representative of materials and finished products as may be requested by Architect.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1.5 QUALITY ASSURANCE:

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.

C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum."

   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

1.6 PROJECT CONDITIONS:

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

1.7 SEQUENCING AND SCHEDULING:

A. Sequence and coordinate installation of wall handrails as follows:

1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.
2. Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.1 FERROUS METALS:

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

1. Provide items with specified galvanized finish for exterior applications.

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Hot-Formed Steel Tubing: ASTM A 501.

    a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

D. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade, as follows:

1. Hot-Rolled Structural Steel Sheet: ASTM A 570, Grade 30, unless otherwise indicated or required by design loading.

E. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

  1. Black finish, unless otherwise indicated.
  2. Galvanized finish for exterior installations.
  3. Type F, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.

F. Malleable Iron Castings: ASTM A 47, grade 32510.

G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

I. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.2 GROUT AND ANCHORING CEMENT:

A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD- C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Available Products: Subject to compliance with requirements, grouts that may be incorporated in the Work include but are not limited to the following:

  1. "Bonsal Construction Grout"; W. R. Bonsal Co.
  2. "Diamond-Crete Grout"; Concrete Service Materials Co.
  3. "Euco N-S Grout"; Euclid Chemical Co.
  4. "Kemset"; Chem-Masters Corp.
  5. "Crystex"; L & M Construction Chemicals, Inc.
  6. "Masterflow 713"; Master Builders.
  7. "Sealtight 588 Grout"; W. R. Meadows, Inc.
  8. "Sonogrout"; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
  9. "Stoncrete NM1"; Stonhard, Inc.
  10. "Five Star Grout"; U. S. Grout Corp.
  11. "Vibropruf #11"; Lambert Corp.

2.3 FASTENERS:

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Machine Screws: Cadmium plated steel, FS FF-S-92.

C. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [nondrilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.

D. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

2.4 PAINT:

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

1. Refer to Section 09900, "Painting", for finish system selection. Advise Architect of anticipated compatibility problems.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

D. Zinc Chromate Primer: FS TT-P-645.

2.5 CONCRETE FILL AND REINFORCING MATERIALS:

A. Concrete Materials and Properties: Comply with requirements of Division 3 section "Concrete Work" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 2,500 psi, 440 lb cement per cu. ft. minimum, and W/C ratio of 0.65 maximum, unless higher strengths indicated.

B. Nonslip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

C. Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

2.6 FABRICATION, GENERAL:

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed traffic surfaces.

F. Weld corners and seams continuously to comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

J. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

L. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.7 STEEL LADDERS:

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3.

B. Siderails: Continuous steel flat bars, 1/2 inch x 2-1/2 inches, with eased edges, spaced 18 inches apart.

C. Bar Rungs: Round steel bars, 3/4 inch diameter, spaced 12 inches o.c.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. by means of welded or bolted steel brackets.

1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.

2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided.

F. Provide non-slip surface on top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

2.8 LOOSE BEARING AND LEVELING PLATES:

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.9 LOOSE STEEL LINTELS:

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS:

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

   1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

      a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide x 1/4 inch x 8 inches long.

C. Galvanize miscellaneous framing and supports in the following locations:

   1. Exterior locations.

2.11 MISCELLANEOUS STEEL TRIM:

A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.

B. Galvanize miscellaneous framing and supports in the following locations:

1. Exterior locations.

2.12 STEEL PIPE RAILINGS AND HANDRAILS:

A. General: Fabricate pipe railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.

1. Comply with applicable sections of the Massachusetts State Building Code for rail spacing and fabrication.

B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

1. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

C. Form changes in direction of railing members as follows:

1. By radius bends of radius indicated.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Provide wall returns at ends of wall-mounted handrails.

F. Close exposed ends of pipe by welding 3/16 inch thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

1. For railing posts set in concrete fabricate sleeves from steel pipe not less than 6 inches long and with an inside diameter not less than 1/2 inch greater than the outside diameter of post, with steel plate closure welded to bottom of sleeve.

   a. Provide friction fit, removable covers designed to keep sleeves clean and hold top edge of sleeve 1/2 inch below finished surface of concrete.

H. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

I. For exterior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

J. For interior steel railings formed from steel pipe with black finish, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.13 STEEL FRAMED STAIRS:

A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for Commercial class stair, except where more stringent requirements are indicated.

B. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers and where stringers are parallel to closure walls. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to strings, newels, and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

C. Metal Pan Risers, Subtreads, and Subplatforms: Shape metal pans for risers and subtreads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than that required, to support total design loading.

1. Form metal pans of uncoated hot-rolled steel sheet, unless otherwise indicated.
2. Attach risers and subtreads to stringers by means of brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting or bolting.
3. Provide subplatforms of configuration and construction indicated; if not indicated, of same metal as risers and subtreads, in thicknesses required to support design loading. Attach subplatform to platform framing members with welds.

D. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for steel pipe railings and handrails, and as follows:

1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

2.14 OPERABLE STEEL GATES:

A. General: Fabricate gates and accessories as indicated from standard steel sections and as follows:

1. When locked, units shall be operable from inside (in the direction of the public way) without use of keys, special tools or hardware. Operation shall comply with egress requirements of the Massachusetts State Building Code for panic operation.
2. Coordinate with work of Section 08710, "Door Hardware", for installation of locking and operating hardware.

B. Fabricate operable gates from indicated components to fit gate posts secured to masonry jamb openings.

1. Provide welded cross bracing or other method to resist sag, warp, or buckling.

C. Anchor gate posts to masonry not more than 6" from top and bottom and at intermediate points spaced not more than 3'-0" o.c. by means of welded steel brackets expansion anchored to masonry.

1. Fasteners: Non-removable bolts set in expanding lead

shield anchors.
2. Provide not less than 4 anchor brackets for each gate post.

D. Furnish hinges and operating mechanisms to permit indicated operation.

   1. Provide not less than four butt hinges, 4-1/2 inches by 4-1/2 inches, per gate leaf.

E. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz. per sq. ft. of coated surface.

2.15 STEEL AND IRON FINISHES:

A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:

   1. ASTM A 153 for galvanizing iron and steel hardware.
   2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

   1. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning:

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

   1. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations unless otherwise indicated; protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL:

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.3 SETTING LOOSE PLATES:

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

   1. Use metallic nonshrink grout in concealed locations where not exposed to moisture; use nonmetallic nonshrink grout in exposed locations, unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLATION OF STEEL PIPE RAILINGS AND HANDRAILS:

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

   1. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with the nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's directions. Cover anchorage joint with a round steel flange attached to post by set screws.
   2. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

   1. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
   2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
   3. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to

support structural loads.

3.5 ADJUSTING AND CLEANING:

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Framing with dimension lumber at unit stairs and as indicated.
2. Wood grounds, curbs, nailers, and blocking.
3. Miscellaneous backer boards.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 06400, "Finish Carpentry", for carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS:

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for the following products:

1. Construction panels.
2. Metal framing anchors.
3. Construction adhesives.

C. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.

D. Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:

1. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For water-borne treated products include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
3. Warranty of chemical treatment manufacturer for each type of treatment.

E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for Project.

1. Metal framing anchors.
2. Power driven fasteners.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL:

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

C. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 DIMENSION LUMBER:

A. For non-structural light framing provide "Stud" or "No. 3" grade lumber for stud framing (2 to 4 inches thick, 2 to 4 inches wide, 10 feet and shorter) and other light framing (2 to 4 inches thick, 2 to 6 inches wide), any species.

B. For structural light framing (2 to 4 inches thick, 2 to 4 inches wide), provide the following grade and species:

1. Same species and design values as indicated for structural framing grade below.

C. For structural framing (2 to 4 inches thick, 5 inches and wider), provide the following grade and species:

1. Any species and grade that complies with the following requirements for species group as defined in Table 8.1a of N.F.P.A National Design Specification, for extreme fiber stress in bending "Fb" for single and repetitive members, and for modulus of elasticity "E":

   a. Group III species, "Fb" of 1100 psi for single member use and of 1300 psi for repetitive member use, and "E" of 1,300,000 psi.

2.3 MISCELLANEOUS LUMBER:

A. General: Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

2.4 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS:

A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

B. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.

C. Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

D. Stair Treads and Risers: APA RATED STURD-I-FLOOR.

1. Exposure Durability Classification: EXPOSURE 1.
2. Span Rating: 24 oc.
3. Edge Detail: Square.

2.5 CONSTRUCTION PANELS FOR BACKING:

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 15/32 inch.

2.6 FASTENERS:

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power Driven Fasteners: National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.7 METAL FRAMING ANCHORS:

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

2.8 MISCELLANEOUS MATERIALS:

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturer.

B. Water Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

2.9 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS:

A. General: Where lumber or plywood is indicated as preservative-treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

B. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood floor plates installed over concrete slabs directly in contact with earth.
3. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

C. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

E. Use common wire nails, unless otherwise indicated. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD FRAMING, GENERAL:

A. Framing Standard: Comply with N.F.P.A. "Manual for Wood Frame Construction," unless otherwise indicated.

B. Install framing members of size and spacing indicated.

C. Anchor and nail as shown, and to comply with the following:

1. National Evaluation Report No. NER-272 for pneumatic or mechanical driven staples, P-Nails, and allied fasteners.
2. Published requirements of manufacturer of metal framing anchors.
3. "Recommended Nailing Schedule" of referenced framing standard and with N.F.P.A. "National Design Specifications for Wood Construction."

D. Do not splice structural members between supports.

E. Use power driven fasteners for anchoring work to steel, concrete, or masonry substrates, unless another fastening method is shown. Comply with reference standards for fastener spacing and pull-out strength if not otherwise indicated.

3.3 STUD FRAMING:

A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Install double bottom and top plates using 2-inch-thick members whose widths equal that of studs. Nail or anchor plates to supporting construction.

1. For stair landing support walls install 2-inch by 4-inch wood studs spaced 16 inches o.c.

B. Install bracing in stud framing of landing support walls. Brace walls as required to other construction to provide stability to stair framing system.

3.4 STAIR FRAMING:

A. General: Install stringers and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal. Attach stringers as follows:

1. At stair head, to wood nailers by toe nailing and metal stair hangers as shown.
2. At landings, to wood supporting members with wood ledgers by toe nailing.
3. At foot of stair, to wood plate secured to concrete substrate, by toe nailing.

B. Install stair framing members of size, space, and configuration indicated or, if not otherwise indicated, to comply with the following requirements:

1. Stringer Size: 2 inches by 12 inches minimum.
2. Notching: Notch stringers to receive treads, risers and supports; leave at least 3-1/2 inches of effective depth.
3. Stringer Spacing: Not less than 3 stringers for each 3'-0" clear width of stair.
4. Provide solid blocking at midpoint in span where stringers exceed 8 feet in length.

C. Install a continuous 2 inch by 8 inch plate, treated at ground floor, under foot of stringers to distribute stair weight on concrete substrate.

D. Fabricate stair framing not to exceed the following variations between treads and risers within each flight of stairs:

1. Adjacent Treads and Risers: 3/16 inch.
2. Between Largest and Smallest Treads and Risers: 3/16 inch.

3.5 INSTALLATION OF CONSTRUCTION PANELS:

A. Fastening Methods: Fasten panels as indicated below:

1. Stair Treads and Risers: Glue and nail to stringer framing throughout.
2. Plywood Backing Panels: Screw fasten to supports.

3.6 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS:

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

END OF SECTION 06100

SECTION 06400 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Interior wood window stools and trim.
2. Unit stair skirts, handrails, and wall caps.
3. Miscellaneous interior wood trim.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 06100, "Rough Carpentry", for furring, blocking, stair framing, and other carpentry work that is not exposed to view.
2. Section 09900 "Field Painting" for final finishing of installed architectural woodwork.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified in this section, including dimensions of profiles.

C. Shop drawings showing location of each item or typical installation, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

D. Samples for selection and verification purposes in the form of 6 inch square pieces of actual materials showing range of colors, grains, and profiles expected.

1. For units indicated to receive transparent finish, provide samples with finishes as indicated in Section 09900, "Field Painting".

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Arrange for production of each type of item, and all items with transparent finish, by a single qualified manufacturer.

B. Code Compliance: Comply with requirements of the Massachusetts State Building Code for stair guard and handrail fabrication, mounting, and strength required.

C. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Protect materials during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver materials until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas.

1.6 PROJECT CONDITIONS:

A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabricating woodwork; show recorded measurements on final shop drawings.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Lumber Standards: Comply with PS 20 "American Softwood Lumber Standard" for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. Stair Woodwork: Provide materials complying with the following requirements for transparent finish:

1. Lumber Grade: Custom.
2. Species: Clear red oak, rift sawn.
3. Appearance: Solid lumber units, free from defects and selected for compatible grain and color.
4. Stair Handrails: red oak, profile similar to Morgan M-821, with brass mounting brackets.

C. Window Stools: One of the following materials, at Contractor's option, complying with indicated requirements for opaque finish:

1. Medium-Density Fiberboard: ANSI A 208.1.
2. High-Density Particle Board: ANSI A 208.1.

D. Miscellaneous Trim: Provide materials complying with the following requirements for opaque finish:

1. Lumber Grade: Custom.
2. Species: Eastern white pine, sugar pine, or Idaho white pine.

2.2 FABRICATION, GENERAL:

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners and edges of solid wood (lumber) members less than 1 in nominal thickness: 1/16 inch.
2. Edges of rails, wall caps and similar members more than 1 inch in nominal thickness: 1/8 inch.

C. Stair Handrails: Fabricate and join rails at transitions in slopes and corners with glued miter joints. Glue, miter and return rail ends to walls.

2.3 FASTENERS AND ANCHORS:

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal framing manufacturer.

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION:

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Trim and Rails: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns and miter at corners.

F. Refer to the Section 09900 for final finishing of installed architectural woodwork.

3.3 ADJUSTMENT AND CLEANING:

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION:

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION 06400

SECTION 06600 - PLASTIC WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Laminate clad plywood paneling.
2. Solid plastic sanitary wall panels on plywood.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified. Include data on physical characteristics, durability, fade resistance, and flame resistance characteristics.

C. Shop drawings showing location and extent of each wall panel type. Indicate termination points.

D. Samples for initial selection purposes of each type of wall panel required, in manufacturer's standard color charts showing full range of colors, textures, and patterns available:

1. Plastic laminate.
2. Plastic panels.

E. Samples for verification purposes of the following:

1. Sample miter joints for plastic laminate wall panels.

1.4 PROJECT CONDITIONS:

A. Maintain a constant temperature not less than 60 deg F (16 deg C) in installation areas for at least 10 days before and 10 days after installation.

1. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
2. Prime new gypsum board with a recommended primer.

3.2 INSTALLATION:

A. Follow manufacturer's printed instructions for installation, where available.

B. Install wall panels with no gaps or overlaps.

C. Install panels plumb, level, true, and straight with no distortions and no horizontal seams. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level and with no variations in flushness of adjoining surfaces.

D. Scribe and cut panels to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

E. Paneling: Anchor paneling to supporting substrate with construction grade organic adhesives and by splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.

3.3 ADJUSTMENT AND CLEANING:

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Repair damaged and defective panels where possible to eliminate defects functionally and visually; where not possible to repair, replace. Adjust joinery for uniform appearance.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas. Use cleaning methods recommended by the manufacturer.

3.4 PROTECTION:

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION 06600

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes hot-applied coal tar dampproofing.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Underslab waterproofing systems, if any, are included in Section 03300, "Cast-in-place Concrete".

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Section "Submittals."

1. Product Data: Include data substantiating that materials comply with specified requirements for each dampproofing material specified.

1.4 PROJECT CONDITIONS:

A. Substrate: Proceed with dampproofing work only after substrate construction and penetrating work have been completed.

B. Weather: Proceed with dampproofing work only when existing and forecast weather conditions will permit work to be performed in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 HOT-APPLIED COAL TAR DAMPPROOFING:

A. Coal-Tar-Based Primer: ASTM D 43.

B. Coal Tar Bitumen: ASTM D 450, Type II or Type III.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hot-applied coal tar products that may be incorporated in the work include, but are not limited to, the following:

1. Celotex Corporation.
2. GAF Building Materials Corporation.
3. GS Roofing Products Company, Inc.
4. Koppers Company, Inc.
5. Manville Building Materials Corporation.
6. Owens-Corning Fiberglas Corporation.

2.2 MISCELLANEOUS MATERIALS:

A. Glass-Fiber Mat: Nonwoven fiberglass fabric of continuous filament or jack-straw filament/yarn pattern of glass fiber, impregnated and bound together with type of organic/synthetic binder that is compatible with type of bituminous compound indicated to be reinforced, weighing 1.0 to 1.5 lbs. per 100 sq. ft., 36-inch-wide rolls.

B. Bituminous Grout: Comply with ASTM D 147.

C. Plastic Cement: Asphalt based, complying with ASTM D 491, except provide coal tar base where specifically recommended by manufacturer of bituminous dampproofing materials.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Inspect substrate for smoothness and absence of conditions detrimental to work. Do not begin work until honeycombing and voids in concrete have been filled and patched.

3.2 PREPARATION OF SUBSTRATE:

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Install separate flashings and corner protection stripping at all inside and outside corners and plane changes in substrate as recommended by prime materials manufacturer, where indicated to precede application of dampproofing.

C. Prime substrate as recommended by prime materials manufacturer.

D. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

3.3 INSTALLATION, GENERAL:

A. Comply with manufacturer's recommendations, except where more stringent requirements are indicated or specified and where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

3.4 BITUMINOUS DAMPPROOFING INSTALLATION:

A. General: Apply dampproofing to all exterior below-grade surfaces of exterior underground walls in contact with earth or other backfill and where space is enclosed on opposite side.

B. Reinforcement: At changes in plane install lapped course of glass-fiber mat in first coat of dampproofing compound before it thickens.

C. Extend vertical dampproofing down walls from finished grade line to minimum of 12 inches below level of lowest floor slab.

   1. Do not install dampproofing on surfaces exposed to view when project is completed.

3.5 HOT BITUMEN ON EXTERIOR SURFACES:

A. Do not apply hot bitumen when substrate condition causes foaming.

B. Apply coat of hot bitumen by mopping or spraying at rate of 20 lbs. or 2.5 gallons per 100 sq. ft., to produce a uniform film thickness of not less than 30 mils.

C. Apply a second coat same as specified above, after allowing 24 hours for curing of first coat. Double thickness of second coat at locations where first application has failed to produce a smooth, lustrous, impervious coat.

END OF SECTION 07160

SECTION 07175 - WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. This Section includes surface preparation and application of clear water repellent coating to the following vertical and non-traffic horizontal exposed surfaces:

1. Exposed exterior concrete surfaces.
2. Exposed interior (unpainted) concrete surfaces.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 03300, "Cast-in-place Concrete", for concrete work.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for water repellents. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

B. Certification by water repllent manufacturer that products supplied comply with local and state regulations controlling the use of volatile organic compounds (VOC).

C. Samples: Prepare 4'-0" square samples of each substrate indicated to receive liquid water repellent as indicated in Part Three.

1.4 JOB CONDITIONS:

A. Weather and Substrate Conditions: Do not proceed with application of water repellent (except with written recommendation of manufacturer) under any of the following conditions:

1. When ambient temperature is less than 40 deg F.
2. When substrate surfaces have cured for less than a period of two months.
3. When rain or temperatures below 40 deg F are predicted for a period of 24 hours, or earlier than 3 days after surfaces became wet.
4. When substrate is frozen.

PART 2 - PRODUCTS

2.1 WATER-BASED ACRYLIC SEALER:

A. Provide manufacturer's standard "water-clear" emulsion-type breathing coating of acrylic resins (based on methyl methacrylate) in water recommended by manufacturer for application to interior and exterior concrete and masonry surfaces as a water-repellent coating; averaging 15% to 22% solids content.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Applied Polymers of America, Inc.
2. OKON, Inc.
3. Seal-Krete, Inc.
4. VIP Enterprises

PART 3 - EXECUTION

3.1 PREPARATION:

A. Test Application: Prior to performance of water repellent work, including bulk purchase/delivery of products, prepare a small application in an unobtrusive location and in a manner acceptable to Architect, for purpose of demonstrating final effect (visual and physical/chemical) of planned installation. Proceed with work only after Architect's acceptance of test application, or as otherwise directed.

B. Clean substrate of substances which might interfere with penetration/adhesion of water repellents. Test for moisture content, in accordance with repellent manufacturer's instructions, to ensure that surface is sufficiently dry.

C. Coordination with Sealants: Where feasible, delay application of water repellents until installation of sealants has been completed in joints adjoining surfaces to be coated with repellent.

D. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass where there is possibility of water repellent being deposited on surfaces. Cover live plant materials with drop cloths. Clean water repellent from adjoining surfaces immediately after spillage. Comply with manufacturer's recommendations for cleaning.

3.2 INSTALLATION:

A. Apply a heavy saturation spray coating of water repellent on surfaces indicated for treatment using low pressure spray equipment. Comply with manufacturer's instructions and recommendations, using airless spraying procedure unless otherwise indicated.

B. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if printed recommendations are not applicable to project conditions.

END OF SECTION 07175

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Insulation under slabs-on-grade.
2. Foundation wall insulation (supporting backfill).
3. Building insulation in batt form.
4. Vapor retarders.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 03300, "Cast-in-Place Concrete", for installation of insulation boards and vapor retarders under slabs and on foundation walls.

C. Work Specified Elsewhere:

1. Section 07241, "Exterior Insulation and Finish Systems - Class PB", for foam plastic insulation specified as part of the system.
2. Section 07270, "Firestopping", for mineral fiber insulation installed as firestopping and fire safing.
3. Section 07530, "Single Ply Membrane Roofing", for roof insulation specified as part of roofing construction.
4. Section 09250, "Gypsum Drywall", for sound attenuation insulation installed as part of metal-framed wall and partition assemblies.

1.3 DEFINITIONS:

A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of insulation product specified.

1.5 QUALITY ASSURANCE:

A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristic: ASTM E 84.
2. Fire Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:

1. Extruded Polystyrene Board Insulation:

   a. Amoco Foam Products Co.
   b. DiversiFoam Products.
   c. Dow: The Dow Chemical Company.
   d. UC Industries, Inc.

2. Manufacturers of Glass Fiber Insulation:

   a. CertainTeed Corp.
   b. Knauf Fiber Glass GmbH.
   c. Manville: Building Insulations Div., Manville Sales Corp.
   d. Owens/Corning Fiberglas Corp.

2.2 INSULATING MATERIALS:

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5-year aged r-values of 5.4 and 5 at 40 and 75 deg F (4.4 and 23.9 deg C), respectively; and as follows:

1. Type IV, 1.6 pcf min. density, unless otherwise indicated.

2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 75 and 450, respectively.

C. Unfaced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I, (blankets without membrane facing); and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass or slag.

2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

2.3 VAPOR RETARDERS:

A. Polyethylene Vapor Retarder: ASTM D 4397, 6.0 mils thick, with a maximum permeance rating of 0.13 perms.

B. Tape for Vapor Retarder: Pressure sensitive tape of type suited for sealing joints and penetrations in vapor retarder.

2.4 AUXILIARY INSULATING MATERIALS:

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding either insulation, anchors, or substrates.

B. Protection Board: Premolded, semi-rigid asphalt/fiber composition board, 1/4 inch thick, formed under heat and pressure, standard sizes.

C. Adesively Attached Pin Anchors: Perforated palte, 2 inches square, welded to projecting pin, with self-locking washer.

1. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

3.3 INSTALLATION, GENERAL:

A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION:

A. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of insulation.

B. Protect below-grade insulation on vertical surfaces (from damage during back-filling) by application of protection board. Set in adhesive in accordance with recommendations of manufacturer of insulation.

C. Protect top surface of horizontal insulation (from damage during concrete work) by application of protection board.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION:

A. Do not install interior building insulation until area is fully weatherproofed.

B. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

1. Batt insulation: Snug fit in stud cavities.

C. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

D. Stuff glass fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume (to a density of approximately 2.5 pcf).

3.6 INSTALLATION OF VAPOR RETARDERS:

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or mechanical fastened system as required for substrate. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners 16 inches o.c.

C. Seal overlapping joints in vapor retarders with adhesives or tape per vapor retarder manufacturer's printed directions. Locate all joints over framing members or other solid substrates.

D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with tape of type recommended by vapor retarder manufacturer to create an airtight seal between penetrating objects and vapor retarder.

F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

3.7 PROTECTION:

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07241 - EXTERIOR INSULATION AND FINISH SYSTEMS - CLASS PB

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SUMMARY:

A. This Section includes the following:

1. Prefabricated panel and field-applied applications over gypsum sheathing and steel stud framing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05400, "Cold-Formed Metal Framing", for steel stud framing assemblies included in panel applications.
2. Section 09262, "Gypsum Sheathing", for gypsum sheathing included in panel applications.

C. Work Specified Elsewhere:

1. Section 07900, "Joint Sealers", for sealing joints in system with elastomeric joint sealants.

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Provide systems complying with the following performance requirements:

1. Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
2. Weathertightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind system including substrates, supporting wall construction, and interior finish.
3. Fire Performance Characteristics: Provide materials and construction that are identical to those tested for the following fire performance characteristics, per test

method indicated below, by testing and inspecting organizations acceptable to authorities having jurisdiction.

a. Flame Spread of Insulation Board and Finish Coats: 25 or less when tested individually per ASTM E 84.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each component of exterior insulation and finish systems.

C. Shop drawings showing fabrication and installation of system including plans, elevations, sections, details of components, joint locations and configurations within system and between system and construction penetrating it, and attachments to construction behind system.

D. Samples for initial selection purposes in form of manufacturer's standard color charts and small-scale samples indicating available textural choices.

E. Samples for verification purposes in the form of 2-foot-square panels for each finish, color, and texture specified. Prepare samples using same tools and techniques intended for actual work.

F. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.

1.5 QUALITY ASSURANCE:

A. Fabricator/Installer Qualifications: Engage an experienced Fabricator/Installer who has completed systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

1. Fabricator/Installer shall be certified by the system manufacturer for fabrication and erection of panelized EIFS systems.

B. Single-Source Responsibility: Obtain materials for system from either a single manufacturer or manufacturers approved by the system manufacturer as compatible with other system components.

C. Field-Constructed Mock-Up: Prior to installation of system, erect mock-ups for each form of wall construction and finish required to verify selections made under sample submittals and to demonstrate esthetic effects including those related to execution and installation. Build mock-ups to comply with the following requirements, using materials indicated for final work:

1. Locate mock-ups on site in location as directed by Architect.
2. Size: Two full panels, one story high by a minimum of 10 feet wide.
3. Include window units, sealant joints, and other abutting construction to indicate effect of completed work.
4. Demonstrate the proposed range of color, texture, and workmanship to be expected in completed work.
5. Obtain Architect's acceptance of mock-ups before start of final work.
6. Demonstrate method of attachment and placment of prefabricated mock-ups, including anchorage and shimming systems indicated on approved shop drawings.
7. Retain and maintain mock-ups during construction for judging completed work.

    a. When directed, demolish mock-ups and remove from Project site.
    b. Undamaged approved mock-ups may be incorporated in the work.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

E. Coordination: Coordinate with installers of exterior framing systems and gypsum sheathing work to ensure substrate meets manufacturer requirements.

1. With installer present, review substrate for fastener spacing, dimensional tolerances, and adequacy of support framing.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products in original, unopened packages and containers with manufacturer's labels identifying products legible and intact.

B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, damage from construction traffic, and other causes.

C. Stack insulation boards flat and off the ground.

D. Comply with requirements of other Sections for handling of fabricated panels.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not install system when ambient outdoor temperatures are 40 deg F (4 deg C) and falling or when precipitation or moisture is forming on exposed surfaces, unless temporary protection and heat are provided to maintain dry surface conditions and ambient temperatures above 40 deg F (4 deg C) during installation of wet materials and for 24 hours after installation or longer to allow them to become thoroughly dry and weather resistant.

1. Comply with more stringent temperature requirements if indicated by manufacturer.

1.8 SEQUENCING AND SCHEDULING:

A. Sequence installation of system with related work specified in other sections to ensure that wall assemblies, including flashing, trim, and joint sealers, are protected against damage from weather, aging, corrosion, and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Materials and Manufacturers: For purpose of establishing a standard of quality, performance, system compatibility, and appearance, "System I" by STO Industries, Inc., has been specified. The following manufacturer's products/system will be accepted if, in the opinion of the Architect, they are equal to that specified:

1. Dryvit Systems, Inc.

2.2 MATERIALS:

A. Compatibility: Provide adhesive, board insulation, reinforcing fabrics, base and finish coat materials, sealants, and accessories that are compatible with one another and approved for use by system manufacturer.

B. Colors and Textures of Protective Coating: Comply with the following requirements:

1. Provide selections made by Architect from manufacturer's full range of standard colors and textures for type of finish coat indicated.

C. Surface-Sealer: System manufacturer's standard adhesion intermediary designed to protect field-applied gypsum sheathing from moisture damage and improve bond to adhesive for application of insulation.

   1. Acceptable Products: "Sto Plex W".

D. Mechanical Insulation Fasteners: System manufacturer's proprietary non-corrosive Type S-12 screw fastener with plastic disc washer for counterbored placement in insulation, with insulating plug cover cap.

   1. Acceptable Products: "Sto Universal Dowel".

E. Adhesive for Application of Insulation: As backup to mechanical fastening, system manufacturer's standard formulation designed for indicated use, compatible with substrate, and complying with the following requirements:

   1. Ready-mixed noncementitious 100% acrylic copolymer formulation designed for adhesive attachment of insulation to gypsum sheathing, as approved by system manufacturer.
   2. Acceptable Products: "Sto Dispersion Adhesive".

F. Molded Polystyrene Board Insulation: Rigid cellular thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with ASTM C 578 for Type I, approved by system manufacturer for material qualities including corner squareness, other dimensional tolerances and the following:

   1. Age insulation in block form prior to cutting and shipping by air drying for not less than 6 weeks or by another method approved by system manufacturer that produces equivalent results.
   2. Provide insulation in boards not less than 2 feet by 4 feet and in thickness indicated but not less than that allowed by system manufacturer.

G. Reinforcing Fabric: Balanced, alkali-resistant open weave glass fiber fabric treated for compatibility with other system materials; made from continuous multi-end strands with tensile strength of not less than 145 lb and 150 lb in warp and fill directions per ASTM D 1682; complying with ASTM D 578 and the following requirements for minimum weight:

   1. Standard Reinforcing Fabric: 4.2 oz. per sq. yd.
   2. High Impact Reinforcing Fabric: 14.0 oz. per sq. yd.

3. Furnish pre-creased units for corner and edged applications.

H. Base Coat Materials: System manufacturer's standard, ready-mixed noncementitious 100% acrylic copolymer emulsion-based ground coat designed for use indicated.

1. Acceptable Products: "Sto RFP".

I. Primer: System manufacturer's silicone emulsion primer for silicone finishes, tinted to selected finish coat color.

1. Acceptable Products: "Sto Silco Prime".

J. Finish Coat Materials: System manufacturer's standard ready-mixed silicone emulsion plaster with colorfast mineral pigments, sound stone particles, and fillers.

K. Panel Joint Seals: System manufacturer's standard preformed compressed foam expansion joint sealant, used as secondary seal system behind wet sealants, in widths required for indicated joints.

1. Acceptable Products: "Sto Seal-X".

L. Water: Clean and potable.

2.3 MIXING:

A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as approved by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates, with Installer present, to determine if they are in satisfactory condition for installation of system. Do not proceed with installation of system until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Protect contiguous work from moisture deterioration and soiling resulting from application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coatings on other work.

B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.

C. Substrate Preparation: Prepare and clean substrates to comply with system manufacturer's requirements to obtain optimum bond between substrate and adhesive for insulation.

D. Apply surface sealer over gypsum sheathing substrates to protect sheathing from premature degradation and improve adhesion.

   1. Sealer shall be installed at all field-applied sheathing and at prefabricated (shop-built) panel sheathing if recommended by the manufacturer.

3.3 INSTALLATION:

A. General: Comply with system manufacturer's current published instructions for installation of system as applicable to each type of substrate indicated.

3.4 INSULATION ATTACHMENT:

A. As a secondary attachement, adhesively attach insulation to comply with the following requirements:

   1. Apply adhesive to insulation by notched trowel method in manner that results in adhesive coating entire surface of gypsum sheathing once insulation is adhered to sheathing, unless system manufacturer instructions specify use of surface sealer in combination with ribbon and dab method.
   2. Allow adhered insulation to remain undisturbed for period prescribed by system manufacturer but not less than 24 hours, prior to beginning rasping and sanding insulation or application of base coat and reinforcing fabric.

B. Apply insulation boards over dry substrates in courses with long edges oriented horizontally; begin first course from a level base line and work upwards.

   1. Stagger vertical joints in successive courses to produce running bond pattern. Offset joints of insulation from joints in sheathing.
   2. Interlock ends at internal and external corners.
   3. Abut boards tightly at joints within and between each course to produce flush, continuously even surfaces

without gaps or raised edges between insulation boards. If gaps occur, fill with insulation cut to fit gaps exactly; insert without use of adhesive.

4. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch from surface of insulation and yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch.
5. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes conforming to details indicated.
6. Interrupt insulation where expansion joints are indicated in substrates behind exterior insulation and finish systems.
7. Form control joints for sealant application by leaving gaps of width needed between adjoining insulation edges as well as between insulation edges and dissimilar adjoining surfaces projecting through insulation that produce joint widths indicated after encapsulation of joint substrates with base coat, reinforcing fabric, and finish coat.

   a. Joint Width: Unless otherwise indicated, finish joints between adjoining panels and at panel perimieter shall be 1" in width.
   b. Joint Width: Unless otherwise indicated, finish joints between EIFS and opening penetrations shall be 3/4" in width.

8. Cut grooves, rabbets, and other features in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that conform accurately to profiles and locations indicated. Do not reduce insulation thickness at features to less than 3/4 inch.
9. Treat exposed edges of insulation board, including those forming substrates of sealed joints within system or between system and other work, by encapsulating with base coat, reinforcing fabric, and finish coat.
10. Coordinate flashing installation with installation of insulation to produce a wall system that does not allow water to penetrate behind protective coating.

C. Mechanically attach insulation to comply with the following requirements:

1. Install fasteners at a spacing not to exceed one per every two sq. ft. of surface area, located at studs, in pattern recommended by manufacturer.
2. Counterbore isulation to receive fasteners using bit designed for task with limit device to limit penetration to manufacturer's recommendation.
3. Install fasteners through sheathing to stud backup, with adequate bite to attain pull-out value indicated in

manufacturer's data for stud gage and cover fastener with preformed insulating thermal cap.

3.5 COATING APPLICATION:

A. Apply ground coat to exposed surfaces of insulation to a uniform depth of 1/8".

B. Fully embed reinforcing fabric of type indicated below in wet base coat to produce wrinkle-free installation with fabric continuous at corners and lapped treated at joints to comply with system manufacturer's requirements. Double-wrap fabric at corners.

1. Standard reinforcing fabric unless otherwise indicated.
2. Impact-resistant reinforcing fabric where impact-resistance is indicated.
3. Pre-creased corner fabrics at edges and corners.

C. Apply tinted primer coat by brush or spray over thoroughly dry ground coat, covering entire surface including edges, corners, reveals, and returns.

1. Primer coat shall completely cover base coat with no flash, bleed-through, or spotting.

D. Apply finish coat over dry base coat in thickness required by system manufacturer to produce a uniform finish of texture and color matching approved sample.

1. Color Matching: Apply finish coat from manufacturer's same batch/production run. Do not use materials from different batches.

3.6 PANEL FABRICATION:

A. General: Comply with indicated requirements for system application, and the following:

1. Section 05400, "Cold-Formed Metal Framing", for requirements relating to steel stud framing assemblies.
2. Section 09262, "Gypsum Sheathing", for requirements relating to gypsum sheathing.

B. Base Coat and Primer Application: Extend base coat, fabric mesh, and tinted primer coat a minimum of 1-1/2 inches onto steel framing at all panel perimeters. Maintain full thickness of ground coat and primer at panel edge.

C. Finish Coat Application: Terminate finish coat at panel face edge; do not extend finish onto panel edges.

1. Mask edges to obtain sharp even line at panel face/edge transition.

D. Erect and install panels as indicated in Section 05400, handling to avoid damage to finish system.

3.7 CLEANING AND PROTECTION:

A. Remove temporary covering and protection of other work. Promptly remove protective coatings from window and door frames and any other surfaces outside areas indicated to receive protective coating.

B. Provide final protection and maintain conditions in a manner acceptable to Installer and system manufacturer that ensures system's being without damage or deterioration at time of Substantial Completion.

END OF SECTION 07241

SECTION 07250 - SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY:

A. This Section includes concealed sprayed-on fireproofing.

B. Extensive fireproofing work is included in Section 09250, "Gypsum Drywall". The Contractor may at his option substitute sprayed-on fireproofing complying with this Section for gypsum drywall systems, provided overall system performance and appearance are not affected.

1.3 SUBMITTALS:

A. Product data for each sprayed-on fireproofing product indicated.

B. Test reports containing the following information:

1. Test results from an independent testing laboratory indicating compliance of sprayed-on fireproofing products with performance requirements indicated, including asbestos content where applicable.
2. Test results of in-place performance as required under Part 3 of this section for field quality control.

C. Certificates from fireproofing manufacturer, for each fireproofing product required, indicating that:

1. Primers applied to steel in shop or field are compatible with sprayed-on fireproofing and will not impair its performance under fire exposure for applications indicated, as proved by ASTM E 119 test.
2. Each fireproofing product required complies with specified product requirements and is suitable for the use indicated.

1.4 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain sprayed-on fireproofing materials from a single manufacturer for each different product required.

B. Fire Performance Characteristics: Provide materials and construction which are identical to those tested for the following fire performance characteristics, per test method indicated, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" for fire-resistance-rated assemblies in which sprayed-on fireproofing serves as direct-applied protection, tested per ASTM E 119.
2. Surface Burning Characteristics: As indicated for each sprayed-on fireproofing product required, tested per ASTM E 84 and listed in UL "Building Materials Directory".

C. Asbestos Content: For products containing lightweight aggregates or mineral fibers, provide products that comply with 29 CFR 1926.58 (OSHA regulations for maximum allowable asbestos content) by containing less than 0.10 percent by weight of asbestos and for which it can be demonstrated that, under reasonably foreseeable jobsite conditions, will not release asbestos fibers in excess of 0.1 fibers per cubic centimeter.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to project site in original, unopened packages with manufacturers' labels identifying products legible and intact. Include on labels names of products and manufacturers, date of manufacture and shelf life, where applicable. Also include UL labels for fire-resistance ratings applicable to project.

B. Use materials with limited shelf life within period indicated. Remove from project site and discard any materials whose shelf life has expired.

C. Store materials inside, under cover, above ground and in a manner to keep them dry until ready to use. Remove from project site and discard any materials that have been exposed to moisture or have otherwise deteriorated.

1.6 PROJECT CONDITIONS:

A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40 deg F (4.4 deg C) and falling, unless temporary protection and heat can be provided to maintain temperatures of both at or above this temperature level for 24 hours before, during, and for 24 hours after application of sprayed fireproofing.

B. Ventilation: Ventilate spray fireproofing by means of natural or, where this is inadequate, of forced air circulation during and after application until it dries thoroughly.

1.7 SEQUENCING:

A. Sequence and coordinate application of sprayed-on fireproofing with other, related work specified in other sections to comply with the following requirements:

1. Provide temporary enclosures to prevent deterioration of sprayed-on fireproofing for interior applications due to exposure to unfavorable environmental conditions.
2. Avoid unnecessary exposure of sprayed-on fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.
3. Do not apply fireproofing to metal roof decking substrates until application of roofing has been completed; prohibit roof traffic during application and drying of fireproofing.
4. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, tested, and corrections made to any defective fireproofing.

PART 2 - PRODUCTS

2.1 CONCEALED SPRAYED-ON FIREPROOFING MATERIALS:

A. General: For concealed applications of sprayed-on fireproofing provide manufacturer's standard products complying with requirements indicated below for material composition and physical properties representative of installed products.

B. Material Composition: One of the following products:

1. Cementitious Fireproofing: Factory-mixed dry formulation of inorganic binders and lightweight mineral aggregates mixed with water at project site to form a slurry for pumping and for dispersal by compressed air introduced at spray nozzle.
2. Mineral Fiber Fireproofing: Factory-mixed dry formulation of inorganic binders, mineral fibers, fillers and additives for sprayed-on application by conveying dry mixture by low pressure air through hose and mixing it with water at spray nozzle.

C. Physical Properties: Minimum values, unless otherwise indicated, measured per standard test methods referenced with each property, as follows:

1. Bond Strength: 80 lbs per sq. ft. per ASTM E 736.
2. Compressive Strength: 3.47 lbs per sq. inch per ASTM E 761.
3. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
4. Deflection: No cracking, spalling, delamination or the like per ASTM E 759.
5. Effect of Impact on Bonding: No cracking, spalling, delamination or the like per ASTM E 760.
6. Air Erosion: Maximum weight loss of 0.025 grams per sq. ft. per ASTM E 859.
7. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605.
8. Hardness: 0.50 inch maximum penetration per ASTM C 569.
9. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 10 and 0, respectively.

D. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

1. Cementitious Fireproofing: "Monokote"; Grace Construction Products Div., W.R. Grace & Co.
2. Mineral Fiber Fireproofing:

    a. "SprayDon Standard J";American Energy Products Corp.
    b. "Cafco Blaze-Shield"; Isolatek International Corp.
    c. "Cafco Deck-Shield"; Isolatek International Corp.

2.2 AUXILIARY FIREPROOFING MATERIALS:

A. General: Provide auxiliary fireproofing materials that are compatible with sprayed-on fireproofing products and substrates, are approved for use indicated by manufacturer of sprayed-on fireproofing, and are approved by UL or other testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance rated designs indicated.

B. Substrate Primers: If required by indicated application, type approved by manufacturer of sprayed-on fireproofing for substrate and for conditions of exposure indicated.

C. Adhesive for Bonding Fireproofing: If required by indicated application, type recommended by manufacturer of sprayed-on fireproofing.

D. Sealer for Mineral-Fiber Fireproofing: Clear-drying water dispersible protective coating recommended by mineral fiber fireproofing manufacturer.

1. Product: Subject to compliance with requirements, provide "Cafco Bond-Seal" by Isolatek International Corp.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates, with Installer present, to determine if they are in satisfactory condition to receive sprayed-on fireproofing. A substrate is in satisfactory condition if it complies with the following:

1. Substrate complies with requirements of the section in which the substrate and related work is specified and is free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
2. Objects which will penetrate fireproofing, including clips, hangers, support sleeves and similar items have been securely attached to substrates.
3. Substrates are not obstructed by ducts, piping, equipment and other suspended construction that could interfere with application of fireproofing.

B. For steel, sheet metal ducts and other substrates suspected of being coated with oil, rolling compounds or other substances not readily identifiable but potentially capable of impairing bond, conduct tests recommended by fireproofing manufacturer to determine their presence and effect on adhesion of fireproofing.

C. Do not proceed with installation of fireproofing until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Clean substrates of substances which could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. Prime substrates where recommended by fireproofing manufacturer, except where compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

C. Cover other work which might be damaged by fall-out or overspray of fireproofing materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and to ensure adequate ambient conditions for temperature and ventilation.

3.3 INSTALLATION, GENERAL:

A. General: Comply with fireproofing manufacturer's instructions for mixing materials, for application procedures and for types of equipment used to convey and spray-on fireproofing materials; as applicable to the particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Coat substrates with adhesive prior to application of fireproofing where required to achieve fire-resistance rating or recommended by fireproofing manufacturer for material and application indicated.

C. Extend fireproofing full thickness over entire area of each substrate to be protected. Unless otherwise recommended by fireproofing manufacturer, install body of fireproof covering in a single course.

D. Apply fireproofing in thicknesses and densities indicated but not less than that required to achieve fire resistance ratings designated for each condition, unless greater thicknesses and densities are indicated.

E. Apply fireproofing materials by sprayed-on method to maximum extent possible. Following spraying operation in each area, complete the coverage by trowel application or other placement method acceptable to manufacturer.

3.4 FIELD QUALITY CONTROL:

A. Testing Laboratory: Contractor shall employ and pay a qualified independent testing laboratory to perform field quality control testing.

B. Extent and Testing Methodology: Arrange for testing of completed fireproofing in successive stages in areas of extent described below; do not proceed with fireproofing of next area until test results for previously completed work evidence compliance with requirements.

1. Extent of Each Test Area: Not greater than two floors.
2. Within each area, testing laboratory shall randomly select a typical bay, and test each fireproofed structural element within it for thickness and density per ASTM E 605.

3. Within each area, testing laboratory shall randomly select one typical structural element of each type and test fireproofing for cohesion/adhesion per ASTM E 736.

C. Testing Laboratory shall report test results promptly and in writing to Contractor and Architect.

D. Repair or replace fireproofing within areas where test results indicate fireproofing does not comply with requirements.

3.5 CLEANING, REPAIR, AND PROTECTION:

A. Cleaning: Immediately upon completion of spraying operations in each containable area of project, remove over-spray and fall-out of materials from surfaces of other work and clean exposed surfaces to remove evidence of soiling.

B. Cure exposed cementitious fireproofing materials in compliance with fireproofing manufacturers recommendations to prevent premature drying.

C. Protect fireproofing according to advice of fireproofing manufacturer and Installer from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion.

D. Coordinate installation of fireproofing with other work in order to minimize the need for other trades to cut or remove fireproofing. As other trades successively complete installation of their work, maintain protection of structure afforded by fireproofing by patching any areas which have been removed or damaged prior to concealment of fireproofing by other work.

E. Repair or replace work which has not been successfully protected.

3.6 FIREPROOFING SCHEDULE:

A. Apply sprayed on fireproofing to meet the following minimum resistance values:

1. Bearing Columns, Girders, and Beams supporting more than one floor: 2 hour assembly.
2. Bearing Columns, Girders, and Beams supporting one floor, and Floor Deck Construction: 1-1/2 hour assembly.
3. Structural Assemblies supporting Shaft Walls: 2 hour assembly.

4. Roof Beams, Girders, Framing, and Roof Deck Construction: 1 hour assembly.

B. Comply with referenced UL assembly requirements where indicated; if not indicated, comply with UL assembly requirement appropriate to the application indicated for fire rating specified.

END OF SECTION 07250

SECTION 07270 - FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following types of firestopping work:

1. Firestopping and Safing insulation at floor penetrations.
2. Firestopping penetrations in fire-rated floor, wall and shaft assemblies.
3. Firestopping perimeters of fire-rated assemblies where abutting adjacent construction.

B. Extent of firestopping work includes sealing penetrations, gaps, voids, perimeters, and other conditions at fire-rated assemblies as required to achieve or restore the indicated fire rating.

C. Related Sections: The following sections contain requirements that relate to this Section:

1. Requirements for installation of firestopping sealants installed in waterproof or exterior assemblies are specified in Section 07900, "Joint Sealants".

D. Work Specified Elsewhere:

1. Acoustic sealant installed at perimeters of sound- and fire-rated partitions in lieu of smoke sealant is specified in Section 09250, "Gypsum Drywall".
2. Pipe sleeves and cable trays are specified in the respective Division 15 and 16 sections.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data and material safety data sheets for each type of firestopping product specified.

C. Manufacturer's written installation instructions for each type of product specified.

D. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of firestopping products with requirements for fire performance characteristics based on comprehensive testing of current products.

E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of firestopping products with Massachusetts State Building Code.

1.4 QUALITY ASSURANCE:

A. Provide products bearing seal of classification of Underwriters Laboratories, Inc. for indicated assembly fire rating.

   1. Where fire-rated assemblies reference U.L. System Numbers, provide firestopping materials approved for use by the U.L. in the indicated assembly.

B. Fire Performance Characteristics: Provide firestopping materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

   1. Fire Tests of Through-penetration Firestops: ASTM E 814 (UL 1479), for indicated fire resistance rating.
   2. Surface Burning Characteristics: Per ASTM E 84, O.
   3. Fire Resistance Ratings: ASTM E 119.
   4. Combustion Characteristics: ASTM E 136.

C. Asbestos Content: Provide firestopping materials completely free of asbestos.

D. Single-Source Responsibility: Obtain each type of firestopping from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to site in manufacturer's unopened containers and packaging bearing manufacturer's name, product identification, U.L. classification labels, and installation instructions.

B. Protect firestopping materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

1.6 PROJECT CONDITIONS:

A. Comply with manufacturer's written instructions for job conditions, including temperature and humidity limitations and ventilation and safety requirements.

B. Sequencing and Coordination: Coordinate installation of firestopping with work of other sections to insure proper installation at required locations.

1. Firestopping shall precede gypsum board finishing.

PART 2 - PRODUCTS

2.1 FIRESTOPPING SEALANTS AND CAULKS:

A. General: Provide manufacturer's standard single component silicone sealant, with accessory materials, providing flexible, airtight, smokeproof, and waterproof seal, capable of bonding to cable jacketing, steel, concrete, and masonry substrates, and complying with the following:

1. Vertical and Overhead Applications: Gunnable.
2. Horizontal Applications: Self-leveling trowel applied.

B. Provide materials with movement capability designed to withstand differential movement between components as indicated.

C. Application: Install sealants at the following locations indicated to receive firestopping:

1. Where differential movement between substrates, or substrates and penetrations is expected.
2. Where required for waterproof joints.
3. Where firestopping will be left exposed as finish work.

D. Available Products: Subject to compliance with requirements, firestopping products that may be incorporated in the work include, but are not limited to, the following:

1. "Biotherm 100" and "Biotherm 200", Bio Fireshield, Inc.
2. "Fire Stop Sealant 2001", Dow Corning Corp.

3. "Flame-Safe FST900", International Protective Coverings, Corp.
4. "Nelson CLK", Nelson Firestop Div. of General Signal.
5. "Fire Barrier CP 25 Caulk", 3M.
6. "Fyre-Shield" and "Fyre-sil", Tremco.

2.2 MINERAL FIBER FIRESTOPPING INSULATION:

A. Fireproof Mineral Fiber Insulation: Noncombustible semi-refractory fiber insulation blankets produced by combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C 612, Class 1 and 2; nominal density of 4.0 pcf; passing ASTM E 136 for combustion characteristics; r-value of 4.0 at 75 deg F (23.9 deg C) and designed for use as a firestop at penetrations in concrete floor slabs.

1. Verify acceptability of indicated product for use as firestopping with authorities having jurisdiction.
2. Application: At the following locations not requiring waterproofing treatment:

    a. As compressible filler and firestopping at stud slip joints.
    b. Between steel deck fluting and abutting partition construction.
    c. At stud cavities and other penetrations in floor assemblies.
    d. Where recommended by manufacturer, as a forming or damming material for other firestopping products.

B. Available Products: Subject to compliance with requirements, firestopping products that may be incorporated in the work include, but are not limited to, the following:

1. Cafco Industries Ltd.
2. Fibrex Inc.
3. USG: Thermafiber Div., USG Interiors, Inc.

2.3 OTHER FIRESTOPPING MATERIALS:

A. Mortar: High-density Portland Cement mortar, minimum 87 pound per cubic foot, achieving minimum 2000 psi compressive strength; providing airtight and smokeproof seal designed to maintain structural integrity in masonry construction.

1. Application: At locations not requiring waterproofing treatment, non-movement joints in concrete and masonry construction.

B. Firestopping Putty: Hand placed, moldable single component non-toxic, non-hardening putty for use around pipe penetrations and in crevices.

C. Foam Firestopping: Two-part job-mixed liquid silicone elastomer; flexible foamed-in-place, formulated for use in a through-penetration fire-stop assembly for filling complex and inaccessible openings around conduit, cables and pipes where movement is expected.

  1. Acceptable Product: "Fire Stop Foam 2000", Dow Corning Corp.

D. Fire-Stopping Accessories: Provide forming, joint fillers, packing, and other materials required for installation of firestopping as applicable to indicated conditions.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION:

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of firestopping are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Clean surfaces and substrates of dirt, oil, loose materials and other foreign materials which may affect the proper bond or installation of firestopping in accordance with manufacturer's directions.

3.2 FIRESTOPPING APPLICATION, GENERAL:

A. Install firestopping for conditions specified or indicated by reference to assembly fire ratings, whether or not firestopping is indicated on drawings.

B. Firestop penetrations in assemblies caused by work of other sections.

  1. Completely fill voids and spaces around mechanical, electrical, and plumbing penetrations.

C. Firestop perimeters of assemblies where abutting other construction, if firestopping is required to achieve indicated fire rating.

  1. Make provisions for differential movement between substrates. Provide flexible sealants, backer rods, bond breakers and other materials as required to provide for movement capability where required.

3.3 INSTALLATION:

A. Comply with firestopping manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation.

1. Comply with safety procedures recommended in Material Safety Data Sheets.
2. Install firestopping as required to meet indicated fire-resistance rating of substrate assembly.

B. Install dams where required to properly contain firestopping materials within opening and as required to achieve indicated fire resistance rating.

1. Use damming material recommended by manufacturer of firestopping.
2. Concealed non-combustible dams may remain in place as a permanent component of firestop system.

C. Install firestops to completely fill voids, penetrations, cracks and gaps in between and within substrates.

D. Finish surfaces of firestopping which is indicated to remain exposed in the completed Work to a uniform, level, flush and neat appearance.

1. Mask or otherwise protect adjacent surfaces to prevent migration or spillage.

3.4 INSTALLATION OF FIRESTOPPING INSULATION:

A. Install safing insulation to fill gaps at penetrations in concrete floor slabs. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of slab with caulking approved by safing insulation manufacturer for this purpose. Leave no voids in completed installation.

3.5 FIELD QUALITY CONTROL:

A. Coordinate installation of firestopping with other sections to assure that all piping, conduit, cable, and other items that penetrate fire-rated assemblies, and assemblies themselves, are correctly and permanently installed prior to beginning installation.

B. Firestopping installation shall equal or exceed indicated fire-resistance rating of substrate assembly.

C. Do not apply firestops to surfaces previously painted or treated with a sealer, curing compound or other coatings unless tests have verified compatibility of materials. Perform compatibility tests if required.

D. Repair or replace firestopping installations that fail to comply with requirements.

  1. Firestopping installations deemed unacceptable by authorities having jurisdiction fail to comply.

3.6 CLEANING AND PROTECTION:

A. Immediately upon completion of application in each area, remove spilled and excess materials without damaging adjacent construction and to remove evidence of soiling.

B. Protect installations from damage due to exposure, physical abuse, and other causes. Provide temporary coverings or enclosures where installations will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07270

SECTION 07530 - SINGLE PLY MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes single-ply ethylene propylene diene monomer (EPDM) membrane roofing systems.

B. Types of roofing systems specified in this section utilizing single ply roofing membranes include the following:

1. Loose laid and ballasted systems.
2. Totally adhered systems.

C. Roof insulation related to flexible sheet roofing is included in this section.

D. Products installed, to be flashed in, or otherwise incorporated as part of the roofing system and included in the roof system warranty, but not furnished under this Section, include the following:

1. Wood nailers, blocking, and other related items specified in Section 06100, "Rough Carpentry".
2. Metal flashing specified in Section 07600, "Flashing and Sheet Metal".
3. Roof accessories specified in Section 07600, "Roof Specialties and Accessories".
4. Copings and fascias specified in Section 07710, "Fascia and Coping Assemblies".
5. Roof drains and vent pipe boots specified in Section 15400, "Plumbing".
6. Roof mounted fans, air handlers, and other mechanical equipment specified in Section 15600, "Heating, Ventilating, and Air Conditioning".
7. Lightning protection, antennas, and other electrical devices specified in Section 16000, "Electrical".

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data, installation instructions, and general recommendations from manufacturer of single ply membrane system for types of roofing required. Include data substantiating that materials comply with requirements.

C. Samples of finished roofing sheets, including T-shaped side/end-lap seam. Also include the following:

1. Samples of aggregate ballast illustrative of type, shape, color.
2. Samples of required insulation.

D. Shop drawings showing roof configuration, sheet layout, seam locations, colors (as applicable), details at perimeter, and special conditions.

1. Indicate layout and fastening of tapered insulation materials.

E. Pre-roofing Conference records.

F. Test data for pullout resistance of fastening systems.

G. EPDM membrane manufacturer's written approval and acceptance of the following:

1. Proposed insulation products and fastening system, indicating suitability for use as substrate for fully adhered systems.
2. Other proposed products not furnished by the EPDM manufacturer.
3. Proposed shop drawings.

1.4 QUALITY ASSURANCE:

A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.

B. Installer: Engage an experienced Installer to apply single ply membrane roofing who has specialized in application of roofing systems similar to those required for this project. Installer must be acceptable to or licensed by manufacturer of primary roofing material.

1. Work associated with single ply membrane roofing, including (but not limited to) insulation, flashing and counterflashing, expansion joints, and joint sealers, is to be performed by Installer of this work.

C. Pre-Roofing Conference: Prior to installation of roofing and associated work, meet at project site, or other mutually agreed location, with Installer, roofing sheet manufacturer, installers of related work, and other entities concerned with roofing performance, including (where applicable) Owner's insurer, test agencies, governing authorities, Architect, and Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours' advance notice to participants prior to convening pre-roofing conference.

D. UL Listing: Provide labeled materials that have been tested and listed by UL in "Building Materials Directory" or by other nationally recognized testing laboratory for application indicated, with "Class A" rated materials/system for roof slopes shown.

E. Variation from Standard Installation: Do not deviate from manufacturer's published installation recommendations and instructions, approved shop drawings, and specifications, without PRIOR WRITTEN APPROVAL of the manufacturer and Architect.

  1. Advise the Architect in writing of any indicated condition that may require a non-standard installation.

F. Design Concept: Drawings indicate relationship between FSR and other work. Manufacturer's standard installation details may vary from those indicated, subject to compliance with these specifications.

1.5 PROJECT CONDITIONS:

A. Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

B. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory condition.

1.6 WARRANTY:

A. Manufacturer's Warranty: The EPDM membrane manufacturer shall provide a ten (10) year written warranty covering, with no dollar limit, the full cost of labor and materials necessary to effect weathertightness, subject to terms and conditions of manufacturer. Provide form that was published with product literature as of date of Contract Documents, and include the following special performance requirement:

  1. Warranted against failure due to wind at speeds up to 100 mph.

B. Warranty shall include flashing, curbs, drains, and accessories installed or integrated as part of the roofing work but furnished by others as indicated in Summary.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Materials and Manufacturers: Products specified in this Section for single ply membrane roofing systems and elastomeric flashing are based on products and systems manufactured by Carlisle SynTec Systems, Carlisle PA, for the purpose of establishing the quality of roofing systems to be used on this project. Other manufacturer's products and systems will be accepted if, in the opinion of the Architect, they are substantially equal to those specified.

B. Compatibility: Provide products that are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

2.2 EPDM MEMBRANE:

A. General: Ethylene propylene diene monomers formed into uniform, flexible sheets, complying with ASTM D4637, Type 1.

1. Class SR, Scrim or fabric internal reinforced.
2. Thickness: 60 mils, nominal.
3. Exposed Face Color: Manufacturer's standard.

B. Loose-Laid and Ballasted EPDM Membrane: Manufacturer's standard installation.

1. Provide system tested and approved for 60 psf uplift rating.

C. Fully Adhered EPDM Membrane: Manufacturer's standard installation.

1. Provide system tested and approved for 90 psf uplift rating.

2.3 AUXILIARY MATERIALS:

A. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.

B. Cant Strips, Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.

C. Flashing Material: Manufacturer's standard system compatible with flexible sheet membrane.

D. Aggregate Surface Ballast: Washed, rounded, riverbed gravel or other acceptable smooth-faced stone ranging in size from 1 inch to 2 inches in diameter. Provide aggregate that will withstand weather exposure without significant deterioration and will not contribute to membrane degradation.

E. Concrete Paver Ballast: Prefabricated concrete pavers designed specifically for ballasting single ply membranes. Provide units with subsurface drainage channels, weighing approximately 12 psf with mininum 2500 psi compressive strength.

F. Membrane Adhesive: As recommended by membrane manufacturer for particular substrate and project conditions, formulated to withstand min. 90-psf uplift force.

2.4 INSULATING MATERIALS:

A. General: Provide insulating materials to comply with requirements indicated for materials and compliance with referenced standards in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

1. Provide tapered boards where indicated for sloping to drain. Fabricate with taper of 1/4 inch per foot, unless otherwise indicated.

B. Polyisocyanurate Board Roof Insulation: Rigid, cellular thermal insulation with polyisocyanurate closed-cell foam core and manufacturer's standard facing laminated to both sides; complying with FS HH-I-1972/2, Class 1.

1. Provide insulation material approved for use as adhered membrane substrate by EPDM manufacturer.

2.5 AUXILIARY INSULATION MATERIALS:

A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with fire resistance requirements.

B. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints and filling voids.

C. Mechanical Anchors: Corrosion-resistant type as recommended by insulation manufacturer for deck type and complying with fire and insurance uplift rating requirements.

1. Provide system tested and approved for I-90 wind uplift rating.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBSTRATE:

A. General: Comply with manufacturers' instructions for preparation of substrate to receive single ply membrane system.

1. Verify that penetrations and blocking are in placed and secured and that roof drains are properly clamped into position.

B. Clean substrate of dust, debris, and other substances detrimental to FSR system work. Remove sharp projections.

C. Install flashing and accessory items as shown, and as recommended by manufacturer if not shown.

D. Prevent compounds from entering and clogging drains and conductors and from spilling or migrating onto surfaces of other work.

3.2 INSULATION INSTALLATION:

A. General: Extend insulation full thickness over entire surface to be insulated, cutting and fitting tightly around obstructions. Form cant strips, crickets, saddles, and tapered areas with additional material as shown and as required for proper drainage of membrane.

1. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses with no gaps, to form a complete thermal envelope.

B. Do not install more insulation each day than can be covered with membrane before end of day or before start of inclement weather.

C. For adhered system, secure roof insulation to substrate with mechanical anchors of type and spacing indicated but in no case provide less than one anchor per 4 square feet of surface area or less anchorage than required by FM "Loss Prevention Data Sheet 1-28."

D. For ballasted system, set insulation units loose on substrate and cover immediately with loose membrane for ballasted installation. Limit joints between adjacent units to 1/4-inch maximum.

3.3 MEMBRANE INSTALLATION:

A. General: Start installation only in presence of manufacturer's technical representative if required as a condition of the warranty.

1. Cut out and repair membrane defects at end of each day's work.

B. Loose-Laid and Ballasted: Install membrane by unrolling over prepared substrate, fastening at perimeter and at roofing penetrations. Lap adjoining sheets and bond, covering top edges of each sheet at seams with uniform fillet of sealant as recommended by manufacturer. Install flashing and counterflashing as shown and as recommended by manufacturer.

1. Apply aggregate ballast in uniform thickness at rate of 12 lbs. per square foot, spreading with care to minimize possibility of damage to membrane.
2. Apply precast concrete paver ballast, where indicated, in strict accordance with manufacturer's instructions.

C. Fully Adhered Membrane: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer. Apply adhesive to surfaces to be bonded and roll into place when adhesive has properly cured. Treat seams with special cement and apply sealant to exposed sheet edges, tapering application as recommended by manufacturer. Install mechanical fasteners, flashing and counterflashing, and accessories at locations and as recommended by manufacturer.

D. Walkway Protection: Install paver units at locations shown and where required for access to roof-mounted equipment. Place protection boards carefully to avoid damage to membrane, laying over an additional layer of roof membrane material, loosely applied, for additional protection.

3.4 FIELD QUALITY CONTROL:

A. In-place Testing: Test for leaks by flooding roof with 2-inch depth of water maintained for 24 hours, unless other test method recommended or required by the manufacturer.

1. Repair any leakage identified by inspection and repeat test until no leakage is observed.

B. Warranty Inspection: If required as a condition of the warranty, conduct an inspection in the presence of the manufacturer's technical representative, Architect, and Owner.

1. Notify Architect at least 48 hours in advance of time of inspection.

C. Additional Testing: The Owner reserves the right to retain an indepedent testing and inspection agency, at her expense, to inspect completed installation for compliance with the approved shop drawings and Contract Documents.

1. Results of such inspection will promptly be made available to the Architect and Contractor.
2. Repair any defects, leaks, or non-conforming installations identified by inspection.

3.5 PROTECTION OF ROOFING:

A. Upon completion of roofing (including associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, make a final inspection of roofing and prepare a written report to Owner, describing nature and extent of deterioration or damage found.

B. Repair or replace (as required) deteriorated or defective work found at time of final inspection to a condition free of damage and deterioration at time of Substantial Completion and in accordance with requirements of specified warranty.

END OF SECTION 07530

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Metal counter flashing and base flashing.
2. Metal wall flashing.
3. Miscellaneous sheet metal accessories.

B. Work Specified Elsewhere:

1. Integral concealed masonry flashings are specified as masonry work in Section 04200, "Unit Masonry".
2. Metal flashing and counterflashing assemblies installed behind EIFS are included in Section 07241, "Exterior Insulation and Finish Systems - Class PB".
3. Roofing flashing and accessories installed integral with roofing membrane are specified in Section 07530, "Single Ply Membrane Roofing", as roofing work.
4. Fascia, coping, and gravel stop assemblies are specified in Section 07710, "Fascia and Coping Assemblies".

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Shop drawings showing layout, profiles, methods of joining, flashing connections, relationship to supporting structure and to adjoining roof and wall construction, and anchorage details, including major counterflashing systems. Provide layouts at 1/4-inch scale and details at 3-inch scale.

1.4 QUALITY ASSURANCE:

A. Industry Standards: Provide products which comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual," except as otherwise indicated.

1.5 PROJECT CONDITIONS:

A. Coordinate work of this Section with adjoining work for proper sequencing of each installation to ensure best possible weather resistance and protection of materials and finishes against damage.

PART 2 - PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM MATERIALS:

A. Sheet Aluminum: ASTM B 209, alloy 3003, temper H14, AA-C22A41 clear anodized finish; 0.032-inch thick (20 gage) except as otherwise indicated.

B. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

C. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.

E. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07900, "Joint Sealants."

F. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.

G. Paper Slip Sheet: 5-lb. rosin-sized building paper.

H. Reglets: Metal or plastic units of type compatible with flashing indicated, noncorrosive.

I. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

J. Roofing Cement: ASTM D 2822, asphaltic.

K. Adhesives: Type recommended by manufacturer for substrate and project conditions, and formulated to withstand minimum 60 psf uplift force.

2.2 FABRICATED UNITS:

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, formed to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Expansion Provisions: Fabricate running lengths to allow controlled expansion not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation or damage.

   1. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

D. Sealant Joints: Where movable, nonexpansion type joints are required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from incompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

   1. Coat all aluminum in contact with other materials with specified bituminous coating. Do not coat surfaces exposed to view.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS:

A. General: Comply with SMACNA "Architectural Sheet Metal Manual". Coordinate with installation of roof deck and other substrates to receive work of this Section, with vapor retarders, roof insulation, roofing membrane, flashing, and wall construction; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor products included in this Section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures. Set units true to line and level as indicated, installed with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or corrosive substrates, including masonry or wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by aluminum producer.

C. Underlayment: Where aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

D. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

E. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

F. Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

3.2 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes. Touch-up damaged metal coatings.

B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION 07600

SECTION 07610 - SHEET METAL ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes flat seam roofing panels.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 07600, "Flashing and Sheet Metal", for roof and wall flashing and other sheet metal work.
2. Section 07900, "Joint Sealants", for requirements of joint sealants installed as part of the roof panel system.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's product specifications, standard details, certified product test results, installation instructions, and general recommendations, as applicable to materials and finishes for each component and for total panel system.

C. Shop Drawings showing layouts of panels on roofs, details of edge conditions, joints, corners, panel profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory and field assembly work.

1.4 QUALITY ASSURANCE:

A. Wind Uplift: Provide formed roof panel system including fasteners meeting requirements of Underwriters Laboratories, Inc. for Class 90 wind uplift resistance.

B. Field Measurements: Where possible, prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS:

A. Aluminum Sheets: Comply with ASTM B 209 for Alclad alloy 3003 or 3004 with temper as required to suit forming operations.

1. Cladding: Where sheets are exterior exposed without color coatings, provide special aluminum alloy-clad sheet known as "Alclad" or clear anodized.

2.2 METAL FINISHES:

A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect finish by packing plastic film or other suitable material between panels in a manner to properly protect the coating.

1. Color: Clear anodized.

2.3 MISCELLANEOUS MATERIALS:

A. Fasteners: Self-tapping screws, self-locking rivets, and other suitable fasteners designed to withstand design loads.

1. Use aluminum, corrosion-resistant steel, or stainless steel fasteners for exterior application.
2. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

B. Felts: Provide asphalt-saturated organic felts conforming to the requirements of ASTM D 226, Type II (No. 30).

C. Accessories: Except as indicated as work of another specification section, provide components required for a complete roof panel system, including head trim, cleats, flashing, sealants, and similar items. Match materials and finishes of panels.

1. Sealing Tape: Pressure-sensitive 100 percent solids polyisobutylene compound sealing tape with release paper

backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

2. Seam Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the panel manufacturer.

D. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15 mil dry film thickness per coat.

2.4 PANEL FABRICATION:

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as required to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensional requirements and with structural requirements.

B. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that are noncompatible or could result in corrosion or deterioration of either material or finishes.

2.5 ROOF PANELS:

A. Lap-Seam Roof Panels: Manufacturer's standard factory-formed flat lap-seam roof panel system designed for mechanical attachment of panels to roof sheathing using concealed cleat fasteners and sealants. Fabricate roof panels to the profile or configuration indicated from 0.032-inch-thick anodized or 3003 or 3004 Alclad alloy finish aluminum sheets.

1. Cleats: Factory-calked, mechanically seamed cleats formed from 24-gage (0.0239-inch), Grade C, zinc-coated steel sheets.

PART 3 - EXECUTION

3.1 PANEL INSTALLATION:

A. General: Comply with manufacturers' instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement.

1. Field cutting of panels by torch is not permitted.
2. Install panels with concealed fasteners.

3. Install roof panels over pitched solid substrate with two plies of felt installed from lower edge up with at least 3-inch side laps and 4-inch end laps.
4. Do not end lap panels. Provide full-length units for each location.
5. Form panels with upturned head to receive counterflashing as indicated.

B. Accessories: Install components required for a complete roof panel system, including trim, cleats, flashings, sealants, gaskets, and similar items.

1. Install cleats at each panel joint as indicated with self-drilling/self-tapping fasteners.
2. Seaming: Complete seaming of panel joints by hand or by operation of portable power-driven equipment of type recommended by panel manufacturer to provide a weathertight joint.

C. Joint Sealers: Install joint fillers, and sealants where indicated and where required for weatherproof performance of panel systems. Provide types of sealants, and fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Provide weatherseal under head flashing.
2. Refer to other sections of these specifications for product and installation requirements applicable to indicated joint sealers.

D. Flat Seam Roof Panels: Provide sealant tape at lapped joints of roof sheets.

1. Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on side laps of panels and elsewhere as needed to make roof sheets weatherproof to driving rains.

3.2 CLEANING AND PROTECTION:

A. Damaged Units: Replace panels and other components of the work that have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

B. Cleaning: Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.

END OF SECTION 07610

SECTION 07700 - ROOF SPECIALTIES AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Types of units specified in this section include the following:

1. Plastic skylight units.
2. Hatch-type heat and smoke vents.
3. Roof hatches.

B. Refer to roofing system sections of these specifications for roofing accessories to be built into roofing system (not work of this section).

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, rough-in diagrams, details, installation instructions and general product recommendations.

B. Colors: Samples for selection purposes in the form of manufacturer's color charts for specified finish.

C. Coordination Drawings: Submit coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping, or conduit. Indicate dimensions and locations of items provided under this section, together with relationships and methods of attachment to adjacent construction and to mechanical/electrical items.

1.4 QUALITY ASSURANCE:

A. Heat/Smoke Vent Compliance Labels: Provide units which have been tested, listed and labeled as follows:

1. Construction/Operation: UL-labeled.
2. Fire Resistance of Lids: UL Class "A".

B. Standards: Comply with SMACNA "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap- flashing to coordinate with type of roofing indicated. Comply with "NRCA Roofing and Waterproofing Manual" details for installation of units.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS:

A. Provide manufacturers' standard units, modified as necessary to comply with requirements. Shop fabricate each unit to greatest extent possible.

2.2 MATERIALS, GENERAL:

A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.

B. Extruded Aluminum: Manufacturer's standard extrusions of sizes and general profiles indicated, alloy 6063-T52; 0.078" minimum thickness for primary framing and curb member legs, 0.062" for secondary legs; AA-C22A41 clear anodized finish on exposed members, except as otherwise indicated.

C. Insulation: Manufacturer's standard rigid or semi-rigid board of glass fiber of thicknesses indicated.

D. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; not less than 1-1/2" thick.

E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

F. Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.

G. Bituminous Coating: FS TT-C-494A or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.

H. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

I. Elastomeric Sealant: Generic type recommended by unit manufacturer, which is compatible with joint surfaces;

comply with FS TT-S-00227E, TT-S-00230C, or TT-S-001543A.

J. Roofing Cement: ASTM D 2822, asphaltic.

2.3 PREFABRICATED PLASTIC SKYLIGHT UNITS:

A. General: Provide manufacturers' standard units, modified as necessary to comply with requirements. Shop fabricate each unit to greatest extent possible.

1. Type: Double-sheet insulating units with 1" minimum air space between sheets, manufacturer's standard edge seal.
2. Color: Furnish unit with specified baked enamel paint finish as selected from manufacturer's standard colors.

B. Curb Frame: Manufacturer's standard formed or extruded aluminum, including cap flashing (to receive roofing counter-flashing).

1. Curb Construction: Provide curb-mount units designed for installation on framing as indicated.

C. Sheet Thicknesses: Except where additional thickness is required for light transmittances, provide glazing plastic sheet thickness required for 40 lbs. per sq. ft. external loading and 20 lbs. per sq. ft. internal loading pressures; comply with thickness recommendations of AAMA Bulletin No. 1601.1.

D. Plastic: Cast acrylic with abrasion-resistant coating on exterior surface, which limits haze increase to a maximum of 2 percent increase per 100 rev. on 500g Taber abraser in accordance with ASTM D 1044; 14,500 psi flexural strength; 180 deg. F (82 deg. C) continuous service temperature.

1. Color: Colorless transparent sheet.

E. Glazing System: Provide manufacturer's standard glazing system of neoprene, closed-cell sponge neoprene, or PVC gasketing, or of partially vulcanized butyl tape or liquid-applied elastomeric sealant.

F. Condensation Control: Fabricate units with integral internal gutters and nonclogging weeps, for permanent control of condensation on inside of units.

G. Available Products: Subject to compliance with requirements, prefabricated plastic skylight units which may be incorporated in the work include, but are not limited to, the following:

1. Wasco Products, Inc. Model "QR-36".

2.4 PREFABRICATED HEAT/SMOKE VENTS:

A. General: Custom fabricate units only to extent necessary for compliance with indicated dimensions and other special requirements. Except as otherwise indicated, fabricate for 40 lbs. per sq. ft. external loading and 20 lbs. per sq. ft. internal loading pressure.

B. Framing: Fabricate of the following materials, with manufacturer's standard welded or sealed mechanical corner joints, including cap flashing (roofing counter-flashing):

1. Material: Formed or extruded aluminum or zinc-coated steel, at Contractor's option.

C. Curb Type: Double-wall curb construction with cant strips and 1" insulation, of height indicated or, if not otherwise indicated, for mounting with height 12" above line of roofing.

D. Hatch-Lid Type Units: Fabricate with single or double aluminum covers (lids) with 1" integral insulation, with gaskets. Equip units with automatic self-lifting mechanisms and fusible links for heat-sensitive and smoke-sensitive release devises, and equip with complete hardware including hold-open devices and independent manual release devices for inside and outside operation of covers.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering heat/smoke vent units which may be incorporated in the work include, but are not limited to, the following:

1. Babcock-Davis Hatchways, Inc.; Arlington, MA
2. Bilco Co.; New Haven, CT
3. Bohem Skylights, Inc.; Burlington, NJ
4. Dur-Red Products; Cudahy, CA
5. Milcor, Inc.; Lima, OH
6. Naturalite, Inc.; Garland, TX
7. Wasco Products, Inc.; Sanford, ME

2.5 PREFABRICATED ROOF HATCHES:

A. General: Fabricate units of sizes shown, single-leaf type unless otherwise indicated, for 40 lbs. per sq. ft. external loading and 20 lbs. per sq. ft. internal loading pressure. Frame with 9" high integral-curb double-wall construction with 1-1/2" insulation, cant strips and cap flashing (roofing counter-flashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 1" insulation core. Equip units with complete hardware set including hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Provide gasketing. Fabricate units of following materials:

1. Materials: Zinc-coated steel sheets.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering prefabricated roof hatch units which may be incorporated in the work include, but are not limited to, the following:

1. Bilco Co.; New Haven, CT
2. Bohem Skylites, Inc.; Burlington, NJ
3. Milcor, Inc.; Lima, OH
4. Plasteco, Inc.; Houston, TX
5. Wasco Products, Inc.; Sanford, ME

2.6 ALUMINUM FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Baked Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8, medium gloss.
2. Color: As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof curbs EIFS, and other substrates to receive units, as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

1. Except as otherwise indicated install roof accessory items in accordance with construction details of "NRCA Roofing and Waterproofing Manual".

B. Isolation: Where metal surfaces of units are to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement, to form a seal.

D. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter-flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

E. Operational Units: Test operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION:

A. Clean exposed metal and plastic surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

B. Clean and polish plastic skylight units, inside and out, not more than 5 days prior to date of substantial completion.

END OF SECTION 07700

SECTION 07710 - FASCIA AND COPING ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Aluminum fascia, gravel stop, and wall cap assemblies.
2. Aluminum coping.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Roofing accessories installed integral with roofing membrane are specified in Section 07530, "Single Ply Membrane Roofing Systems".
2. Sheet metal and flashings not part of fascia and coping systems included in this Section are specified in Section 07600, "Flashing and Sheet Metal".

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's technical data, installation instructions and general recommendations for each product specified. Include data substantiating that materials and performance comply with requirements.

C. Shop drawings indicating layout, joining, profiles, accessories, anchorages, flashing connections, and relationship to supporting structure and to adjoining roof and wall construction.

D. Samples for initial selection purposes in form of manufacturer's sample finishes showing full range of colors and textures available for those units with factory-applied color finishes.

E. Samples for verification purposes of each type of exposed finish required, prepared on samples 8 inches by 8 inches of same thickness and material indicated for final unit of Work.

1.4 QUALITY ASSURANCE:

A. Insurance Requirements: Provide fascia systems complying with Factory Mutual Loss Prevention Data Sheets 1-49 "Perimeter Flashing" requirements in either of the following categories and wind zones.

1. Accepted by Factory Mutual for Zone 1 use at locations less than 50 feet above finish grade.
2. Accepted by Factory Mutual for Zone 2 use at locations greater than 50 feet above finish grade.

B. Industry Standards: Provide products which comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual," except as otherwise indicated.

C. Single Source Responsibility: Obtain all products included in this Section from a single source and one manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum Sheet: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

B. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, hot dipped galvanized in accordance with ASTM A 525, with G90 coating designation, mill phosphatized.

C. Concealed Fasteners: Same metal as item fastened or other noncorrosive metal as recommended by manufacturer.

D. Mastic Sealant: Polyisobutylene; non-hardening, nonskinning, nondrying, nonmigrating sealant.

E. Foam Rubber Seal: Manufacturer's standard foam.

2.2 FASCIA AND WALL CAP ASSEMBLIES:

A. Fascia and Gravel Stop for Single-Ply Roofing: Manufacturer's standard system consisting of fascia formed from minimum 0.050-inch-thick aluminum sheet designed to interlock with water dam, minimum 24 gage formed, zinc-coated steel water dam/hold-down clip, of profile and fascia height indicated; with prefabricated accessories including inside and outside corner miters welded before finishing.

1. Thickness: 0.050 inch.
2. Height of Gravel Stop: Minimum 2 inches.
3. Accessories: Provide manufacturer's standard accessories of the following type, designed and manufactured to match and fit to fascia system indicated:

    a. Formed fascia extenders of profile and size indicated and continuous cleat attachment.
    b. Spillout Scupper with minimum 4" extension.

4. Products: Subject to compliance with requirements, provide one of the following.

    a. Perma-tite System 100/200; Metal-Era Roof Edge Systems.
    b. Econosnap Roof Edge System; W.P. Hickman Co.
    c. Presto Lock Fascia and Flashing System; Manville Corp.
    d. Snap-Lok Fascia System; MM Systems Corp.

B. Wall Cap: Formed brick wall cap of profile and size indicated to match profiles of gravel stops and fascia assemblies, with continuous zinc-coated steel cleat attachment.

1. Fabricate all units to pitch for drainage.

2.3 ALUMINUM COPING:

A. Interlocking Multi-Part Coping System: Manufacturer's standard system consisting of coping formed from aluminum sheet to profile and of thickness indicated, minimum 24 gage (nominal 0.0276-inch-thick) zinc-coated steel anchor plate or cleat located at coping joint, formed splice plates, compression springs, and sealant at splice plates; with prefabricated inside and outside corners, miters welded before finishing; without exposed fasteners.

1. Thickness of Coping: 0.050 inch.
2. Exposed height of Coping: 4-1/2 inches.
3. Products: Subject to compliance with requirements, provide one of the following:

    a. Perma-Tite Coping; Metal-Era Roof Edge Systems.
    b. Rapid-Loc Coping; Atas Aluminum Corp.
    c. Splice-Lock Coping Cover System; Cheney Flashing

Co.
d. Permasnap Coping; W. P. Hickman Co.
e. Neo-Lock Coping; Merchant and Evans Industries, Inc.
f. Snap-Lok Coping; MM Systems Corp.
g. Pac-Loc Coping; Petersen Aluminum Corp.

2.4 FABRICATION:

A. General: Provide items designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.

1. Fabricate wall caps of same profile as fascias to align with and join where indicated.
2. Fabricate all units with lipped edges forming positive drips against water migration.

B. Expansion Provisions: Fabricate running lengths to allow controlled expansion not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation or damage.

2.5 ALUMINUM FINISHES:

A. General: Comply with AMP 501 "Finishes for Aluminum" and AMP 505 "Applied Coatings" for finish designations and application recommendations, except as otherwise indicated. For components which are assembled or welded in factory, apply finish after fabrication is completed.

1. Provide colors as selected by Architect from manufacturer's standard colors.

B. Class I Color Anodized Finish: AA-C22A42 (medium matte etched finish with minimum 0.7-mil-thick, integrally colored anodic coating).

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's written installation instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive work of this Section, with roof insulation, roofing membrane, flashing, blocking, and wall construction; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor products included in this Section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by aluminum producer.

3.2 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch-up damaged metal coatings.

B. Protection: Provide protective measures as required to ensure that work of this Section will be without damage or deterioration at time of substantial completion.

END OF SECTION 07710

SECTION 07900 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
    - a. Control joints in cast-in-place concrete, brick unit masonry, and Exterior Insulation and Finish Systems (EIFS).
    - b. Joints between different exterior materials.
    - c. Perimeter joints between materials listed above and frames of doors and windows, louvers, and other openings.
    - d. Other joints as indicated.
2. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
    - a. Perimeter joints of exterior openings where indicated.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, elevator entrances, and other assemblies.
    - c. Perimeter joints of bath fixtures and bath tile.
    - d. Non-working finish joints between different abutting materials.

B. Work Specified Elsewhere: The following Sections include sealant work not part of this Section:

1. Section 07270, "Firestopping", for sealants and fillers installed as firestopping.
2. Section 07600, "Flashing and Sheet Metal", for sealing lock joints and seams related to flashing.
3. Section 08800, "Glass and Glazing", for sealants used in glazing.
4. Section 09250, "Gypsum Drywall", for sealing concealed perimeter joints of gypsum board partitions to reduce

sound transmission.

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

E. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated, and product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

F. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

1. Installer shall be approved by the sealant manufacturer.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

C. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Architect.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
2. Include test results performed on joint sealants after they have cured for 1 year.

D. Field-Constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:

1. Joints in field-constructed mock-ups of exterior finish assemblies specified in Sections 04200 and 07241 that are indicated to receive elastomeric joint sealants specified in this Section.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are

outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).

2. When joint substrates are wet.

B. Obtain Architect's written approval before installing exterior joint sealants between 15 November and 15 March.

C. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

D. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide custom colors to match Architect's samples where indicated in sealant schedule.
2. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated unless otherwise indicated.

2.2 ELASTOMERIC JOINT SEALANTS, GENERAL:

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated for each Elastomeric Joint Sealant specified in this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

B. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

2.3 ELASTOMERIC JOINT SEALANT DESIGNATED "ES-1":

A. Description: High performance low modulus modified urethane sealant for vertical and non-traffic horizontal surfaces.

B. Performance Characteristics: Complying with ASTM C 920 as follows:

1. Type: M.
2. Grade: NS.
3. Class: 25.
4. Uses: NT, M, A, and O as follows: concrete, EIFS, galvanized steel, and color anodized aluminum.

C. Additional Movement Capacity: 50% movement in extension or compression; 100% total.

D. Colors: Assume three colors for project; match Architect's sample for one, two from manufacturer's standard product range.

E. Acceptable Products:

1. "Dynatrol II", Pecora.
2. "Dymeric Plus", Tremco.

2.4 ELASTOMERIC JOINT SEALANT DESIGNATED "ES-2":

A. Description: One-part mildew-resistant acid curing silicone sealant formulated with fungicide for sealing interior non-porous joints in areas of high moisture.

B. Performance Characteristics: Complying with ASTM C 920 as follows:

1. Type: S.
2. Grade: NS.
3. Class: 25.
4. Uses: NT, G, A, and O as follows: porcelain, enameled steel, vitreous china, ceramic tile, composition plastics, and plastic laminates.

C. Acceptable Products:

1. "Dow Corning 786", Dow Corning Corp.
2. "SCS 1702 Sanitary", General Electric Co.
3. "863 #345 White", Pecora.

2.5 LATEX JOINT SEALANT DESIGNATED LS-1:

A. Description: Manufacturer's standard one-part mildew-resistant paintable acrylic-emulsion latex sealant for exposed applications on interior and protected exterior locations.

B. Performance Characteristics: Complying with ASTM C 834 as follows:

1. Type: S.
2. Grade: NS.
3. Movement Capability: 5 percent in both extension and compression for a total of 10 percent.

C. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. "AC-20," Pecora Corp.
2. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
3. "Tremco Acrylic Latex 834," Tremco, Inc.

2.6 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of one of the materials indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS:

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and as indicated.

   1. Acceptable Products: Subject to compatibility with specified joint sealants:

      a. Primer P-75, Pecora.
      b. Primer #733, Sonneborn.
      c. Primer #P1, Tremco.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. General: Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

   1. Do not install sealants to painted or organic coated surfaces unless adherence has been verified.

B. Inspection of EIFS joint substrates:

   1. Verify that joints are 1 inch in width; do not install joint sealants in joints less than 7/8 inch or greater than 1-1/4 inch in width.
   2. Verify that EIFS finish coat (containing aggregate) has not been installed in joint width.
   3. Verify that waterproof compressible foam sealer has been properly installed at all EIFS panel joints as indicated; do not install sealants or backers in joints missing compressible foam sealers.

C. Beginning installation of joint sealants and accessories constitutes acceptance of substrate conditions. Subsequent joint failure due to failure to properly examine or require correction of substrates shall be the responsibility of this Section.

3.2 PREPARATION:

A. Surface Cleaning of Joints: Clean out joints immediately before installing primers or sealers, if no primer is required, to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Use solvent cleaner recommended by sealant manufacturer for joint substrate.
2. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
3. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
4. Remove laitance and form release agents from concrete.
5. Clean metal, glass, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated below and where recommended by joint sealant manufacturer based on prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

1. All joints, without exception, indicated to receive sealant ES-1 shall be primed.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS:

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

   1. Do not install sealants until primer has dried.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.

   1. Comply with ASTM C 1193 if applicable.

C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

   1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

      a. Install joint filler rods 25 percent greater in diameter than joint width, unless otherwise indicated.
      b. Do not leave gaps between ends of joint fillers.
      c. Do not stretch, twist, puncture, or tear joint fillers.
      d. Do not install wet joint fillers. If fillers become wet before installation of sealant, remove and replace.

   2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
2. Provide flush joint configuration, per Figure 5B in ASTM C 962, where indicated. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING:

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION:

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 SEALANT SCHEDULE:

A. General: Install specified sealants at all joint substrates as indicated. If a substrate condition is not indicated, seek clarification from Architect.

B. **Sealant ES-1** (Non-Sag High-Performance Urethane):

1. Exterior non-traffic control and expansion joints in concrete, masonry, and EIFS system.
2. Exterior perimeters of windows, doors, louvers, and other penetrations in exterior finish.

C. **Sealant ES-2** (Mildew-Resistant Silicone):

1. Joints between tub/shower enclosures and adjoining construction.
2. Joints between ceramic mosaic floor tile and water closet perimeter, bath tub, and tile base.
3. Joints between lavatory and sink rims and countertops, and at perimeter of countertop splash with wall surface.
4. Joints between resilient sheet flooring and wall base.

D. **Sealant LS-1** (Acrylic Latex):

1. Interior finish joints between gypsum wallboard and adjoining concrete, masonry, finish carpentry, cabinetry, and opening frames.
2. All other interior joints between dissimilar materials not indicated otherwise.

END OF SECTION 07900

SECTION 08100 - STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following products manufactured in accordance with SDI Recommended Standards:

1. Doors: Seamless, hollow or composite construction standard steel doors for interior and exterior locations, factory primed for field painting.
2. Frames: Pressed steel frames, factory primed, for doors, transoms, sidelights, mullions, interior glazed panels, and other interior and exterior openings of following type:

    a. Welded unit type.
    b. Knockdown field assembled type.

3. Assemblies: Provide standard steel door and frame assemblies as required for the following:

    a. Labeled and fire rated.
    b. Thermal rated (insulated).
    c. Sound rated (acoustical).

B. Related work specified in other Sections:

1. Building in of anchors and grouting of frames in masonry construction is specified in Section 04200, "Unit Masonry".
2. Wood doors installed in steel frames are specified in Section 08200, "Flush Wood Doors".
3. Door operating hardware is specified in Section 08710, "Door Hardware".
4. Glazing for steel doors and frames is specified in Section 08800, "Glass and Glazing".
5. Painting primed doors and frames is specified in Section 09900, "Painting".

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Manufacturer's product data for each type of door and frame specified indicating that products comply with requirements.

C. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
2. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE:

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies whose fire resistance characteristics have been determined per ASTM E 152 and which are labeled and listed by UL, Factory Mutual, Warnock Hersey, or other testing and inspecting organization acceptable to authorities having jurisdiction.

1. Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of 250 deg F (121 deg C) maximum in 30 minutes of fire exposure.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Amweld Building Products, Inc.
2. Ceco Corp.
3. Copco Door Co.
4. Curries Company.
5. Deansteel Manufacturing Co.
6. Fenestra Corp.
7. Kewanee Corp.
8. Mesker Door Co.
9. Pioneer Industries.
10. Premier Products, Inc. (Formerly Dittco).
11. Republic Builders Products.
12. Steelcraft Manufacturing Co.

2.2 MATERIALS:

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, or drawing quality, ASTM A 642, hot dipped galvanized in accordance with ASTM A 525, with A60 or G60 coating designation, mill phosphatized.

D. Supports and Anchors: Fabricate of not less than 18-gage sheet steel; galvanized where used with galvanized frames.

1. Hinge reinforcements shall be not less than 8-gage.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.

F. Shop Applied Paint: Apply after fabrication: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

G. Silencers: Neoprene Rubber; Ives 20 or equal.

2.3 DOORS:

A. Provide metal doors of types and styles or grades and models indicated on drawings or schedules.

B. Provide metal doors of SDI grades and models specified below or as indicated on drawings or schedules:

1. Interior Doors: ANSI/SDI-100, Grade I, standard duty, Model 3 or 4, minimum 18-gage cold-rolled sheet steel faces.
2. Exterior Doors: ANSI/SDI-100, Grade II, heavy duty, Model 4, minimum 16-gage galvanized steel faces.

C. Door Louvers: Provide sightproof stationary louvers for interior doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24-gage cold-rolled steel set into minimum 20-gage steel frame.

2.4 FRAMES:

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 18-gage cold-rolled steel unless otherwise indicated.

1. Fabricate frames with mitered or coped corners, welded construction for exterior applications and knocked-down for field assembly at interior applications.
2. Form exterior frames from 16-gage galvanized steel.

B. Door Silencers: Except on weatherstripped frames, install 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

2.5 FABRICATION:

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Internal Construction: Manufacturer's standard

honeycomb, polyurethane, polystyrene, unitized steel grid, vertical steel stiffeners, or rigid mineral fiber core with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.

2. Clearances: Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.

B. Fabricate exposed faces of doors from only cold-rolled steel.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel.

E. Fabricate exterior doors and frames from galvanized sheet steel in accordance with SDI-112. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.

   1. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.050 Btu/(hr x sq ft x deg F.) or better.
   2. Frames: Install thermal break at stops at exterior frames for doors, transoms, and sidelights. Thermal break shall consist of closed-cell polyethelene foam barrier between frame and stob rabbet, creating posive thermal barrier.

      a. Acceptable Product: "Thermal Berak Hollow Metal Door Frame", Curries, Co.

H. Sound-Rated (Acoustical) Assemblies: At interior apartment entry doors provide door and frame assemblies fabricated as sound-reducing type, tested in accordance with ASTM E 90, and classified in accordance with ASTM E 413.

   1. Unless otherwise indicated, provide acoustical assemblies with sound ratings of STC 33 or better.

I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.

J. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

K. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

L. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

   1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
   2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

M. Glazing Stops: Minimum 20 gage steel or .040-inch-thick aluminum.

   1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
   2. Provide screw applied removable glazing beads on inside of glass, louvers, and other panels in doors.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated.

   1. Place welded frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

2. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry Tee anchors.
3. Install fire-rated frames in accordance with NFPA Standard No. 80.
4. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In closed steel stud partitions, attach wall anchors to studs with screws.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.

1. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.
2. Hang doors level, plumb, straight and true, to operate without binding and to remain open in any position without moving.

3.2 ADJUST AND CLEAN:

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08100

SECTION 08200 - WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Extent and location of each type of wood door is indicated on drawings and in schedules.

B. Types of doors required include the following:

1. Solid core flush wood doors with wood veneer faces.
2. Hollow core flush wood doors with wood veneer faces.

C. Shop-priming of flush wood doors is included in this section.

D. Factory prefitting to frames and premachining for hardware for wood doors is included in this Section.

E. Related work specified in other Sections:

1. Metal door frames for wood doors are specified in Section 08100, Standard Steel Doors and Frames".
2. Door operating hardware is specified in Section 08710, "Door Hardware".
3. Painting primed doors and frames is specified in Section 09900, "Painting".

1.3 SUBMITTALS:

A. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.

B. Shop Drawings: Submit shop drawings indicating location and size of each door.

1. Provide schedule of doors using reference numbers indicated on contract drawings and coordinated with frame and hardware schedules specified in other sections.

2. For factory-premachined doors, indicate dimensions and locations of cutouts for locksets.

1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:

1. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).
2. AWI Quality Standard: "Architectural Woodwork Quality Standards"; including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

B. NWWDA Quality Marking: Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S. 1 Series.

C. Single-source Responsibility: Obtain all doors of each type from a single manufacturer.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.

B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS:

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and to comply with the following requirements:

1. Referenced AWI quality standard including Section 100-S-3 "Moisture Content".

1.7 WARRANTY:

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Manufacturer's Warranty: Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall also include reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
2. Warranty shall be in effect during following period of time after date of Substantial Completion.
3. Solid Core Interior Doors: Life of installation.
4. Hollow Core Interior Doors: Two years.

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors which may be incorporated in the work include, but are not limited to, the following:

1. Solid Core Doors with Wood Veneer Faces:

   a. Buell Door Company.
   b. Chappell Door Company.
   c. Doors, Incorporated.
   d. Eggers Industries, Architectural Door Division.
   e. Graham Manufacturing Corp.
   f. Ipik Door Co., Inc.
   g. Mohawk Flush Doors, Inc.
   h. Weyerhauser Company.

2. Hollow Core Doors:

   a. Glen-Mar Door Mfg. Co.
   b. Ipik Door Co., Inc.
   c. Weyerhauser Company.

2.2 INTERIOR FLUSH WOOD DOORS:

A. Solid Core Doors for Opaque Finish: Comply with the following requirements:

   1. Faces: Any closed-grain hardwood of mill option.
   2. AWI Grade: Economy.
   3. Construction: PC-5 (Particleboard core, 5-ply).

B. Hollow Core Doors for Opaque Finish: Comply with the following requirements:

   1. Faces: Any closed-grain hardwood of mill option.
   2. AWI Grade: Economy.
   3. Construction: SHC (Standard hollow core).

2.3 FABRICATION:

A. Fabricate flush wood doors to produce doors complying with following requirements:

   1. Factory-prefit and premachine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:

      a. Comply with tolerance requirements of AWI for prefitting. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
      b. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory premachining.

2.4 SHOP PRIMING:

A. Doors for Opaque Finish: Shop prime all exposed portions, including top and bottom edges, of doors for paint finish with one coat of wood primer specified in Section 09900, "Painting".

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine installed door frames prior to hanging door:

   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject frames with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Hardware: For installation see Section 08710, "Door Hardware", of these specifications.

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and of referenced AWI standard and as indicated.

C. Hanging: Install doors plumb, true and level to operate freely without binding and to remain in any position without moving.

D. Prefit Doors: Fit to frames for uniform clearance at each edge.

3.3 ADJUSTING AND PROTECTION:

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Damaged Doors: Repair or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08200

SECTION 08305 - ACCESS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Drawings of plumbing, mechanical, fire protection, and electrical trades are included by reference in this Section.

1.2 SUMMARY:

A. This Section includes access doors as required by referenced trades for installation in the following types of construction:

1. Gypsum drywall.
2. Masonry.

B. Provide fire-rated access doors where installation is indicated in a fire-rated assembly.

C. Building-in of anchors and grouting of frames set in masonry construction is specified in Section 04200.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data in form of manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage, devices.
2. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.

B. Fire-Resistance Ratings: Wherever a fire-resistance classification is required, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters Laboratories, Inc.'s "Building Materials Directory" for rating shown.

1. Provide UL label on each fire-rated access door.

C. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS:

A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering access doors that may be incorporated in the work include, but are not limited to, the following:

1. Bar-Co., Inc.
2. Cesco Products
3. J.L. Industries
4. Karp Associates, Inc.
5. Milcor, Inc.
6. Nystrom, Inc.
7. The Williams Brothers Corp.

2.2 MATERIALS AND FABRICATION:

A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.

B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

C. Frames: Fabricate from 16-gage steel.

1. Fabricate frame with exposed flange nominal 1-inch wide

around perimeter of frame for units installed in exposed masonry.
2. For gypsum drywall, furnish perforated frames with drywall bead for taped finish.
3. For installation in masonry construction, furnish frames with adjustable metal masonry anchors.

D. Flush Panel Doors: Fabricate from not less than 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.

1. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

E. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Comply with manufacturer's instructions for installation of access doors.

B. Coordinate installation with work of other trades.

C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

3.2 ADJUST AND CLEAN:

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08305

SECTION 08350 - METAL BI-FOLD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes metal bi-fold doors and operating hardware.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of door and installation accessory specified, including templates, dimensions, and clearances required.
2. Schedule of door units using same designations indicated on drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are not limited to the following:

1. Benchmark (General Products Co., Inc.)
2. Floataway Home Products, Inc.
3. Paniflex Corp.
4. Slimfold Mfg. Co., Inc.

2.2 BI-FOLDING DOORS:

A. General Description: Folding doors hinged together and suspended from overhead track.

B. Metal Panels: Sizes as indicated, 0.0239-inch thickness

(24-gage) cold-rolled steel, prefinished and as follows:

1. Surface Profile: flush.
2. Finish: Electrostatically applied and baked enamel factory finish in white.

C. Hardware: Hinges, pivots, and rollers factory installed. Manufacturer's standard, as follows:

1. Three self-aligning hinges for pair of panels.
2. Zinc-plated steel guide and spring-loaded pivot pins with nylon bushings and nylon tips.
3. Stainless steel 3" wire pulls.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's printed installation instructions. Install track in lengths as long as practicable, with flush, hairline joints.

B. Install units straight, plumb, true and centered in gypsum finish opening, to operate without binding or catching.

1. Locate units so that face of door panel when closed is recessed 1/4" from face of adjoining wall surface.

C. Standard Clearances: Install units to meet the following:

1. Floor: 1/2 inch to 1 inch max. (above floor finish).
2. Vertical Joints: 1/4 inch.

3.2 ADJUSTMENTS:

A. Adjust units as necessary to assure smooth, quiet operation without warping or binding. Check and readjust operating hardware so that latches engage accurately and positively without forcing and binding.

END OF SECTION 08350

SECTION 08390 - COMBINATION STORM AND SCREEN DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Extent: Install specified units on all courtyard exterior rowhouse doors.

1.2 SUMMARY:

A. This Section includes packaged combination self-storing storm and screen doors, with frame and operating hardware.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's product data and installation instructions indicating elevation, door construction, type of corner reinforcement, method of glazing, method of changing between glazing and screen units, installation details and tolerances, and fastener type.

C. Standard finish samples for selection of colors.

1.4 QUALITY ASSURANCE:

A. Regulatory Requirements: Comply with State and Local regulations and with the following standards:

1. Fabrication and Construction: ANSI/AAMA 1102.7 "Specification for Aluminum Storm Doors".
2. Installation: ASTM E 737 "Installation of Storm Windows, Storm Doors, and Replacement Doors".

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. The Harvey Corp., Woburn, MA.
2. Kane Corp., Kane, PA.
3. Metal Industries Inc., Elizabethtown, PA.

2.2 MATERIALS AND FABRICATION:

A. General: Provide manufacturer's standard packaged units complying with referenced standards, with components and accessories as required for a complete installation.

B. Door Stiles and Rails, and Frame Sections: Hollow extruded aluminum sections, structurally sufficient to suit opening sizes.

C. Glazing: Single pane, tempered clear safety glass, 1/8" thick.

D. Insect Screen: Woven aluminum mesh.

E. Operating Hardware: Manufacturer's standard package including the following:

1. Hinges: Continuous piano or minimum two butt type, stainless steel leaves and pin.
2. Latch: Cast aluminum, thumb push on exterior, thumb latch on interior, with steel pin and spring stop.
3. Closer: Adjustable, spring loaded, hydraulic cylinder with hold open feature.
4. Stop: Storm chain with spring safety cushion.
5. Weatherstrip: Full perimeter wool pile or vinyl type, with drop sill sweep for full width of door.

F. Accessories:

1. Sealant: Acrylic, for exterior work.
2. Fasteners: Galvanized steel.

G. Fabrication: Manufacturer's standard, with the following:

1. Assemble perimeter stiles and rails with hairline mitered corner joints. Align, secure and reinforce corners with corner spigots retained with screw or rivet fasteners.
2. Fit intermediate cross rail accurately, cope to fit stiles, secure with screw or rivet fasteners.
3. Provide for vertical independent operation of glass panels and insect screens. Fit with spring loaded retracting pin position retainers. Screens and glazing panels shall be self-storing within the door.

H. Finish: Baked enamel, as selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Do not begin installation until openings are ready to receive work.

  1. Coordinate installation with work of other trades to minimize traffic through completed installation.

B. Install units, accessories, and hardware in accordance with manufacturer's instructions and ASTM E 737.

C. Apply bed of sealant to mating surface of door frame.

D. Accurately fit and secure door frame to building opening.

3.2 REPAIR, CLEANING AND ADJUSTING:

A. Adjust operable parts for smooth operation and to minimize air leakage around door perimeter.

B. Immediately prior to Substantial Completion, inspect work for damage and deterioration. Repair or replace damaged work, readjust as required, and clean all components.

END OF SECTION 08390

SECTION 08500 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes commercial- and heavy commercial-grade aluminum window units of the performance class indicated. Window types required include:

1. Single hung and combination (containing fixed and single hung sash) windows.
2. Aluminum insulated panels installed in window frames in lieu of glazing.

B. Factory glazing of aluminum window units is included in this Section.

C. Related Sections: The following sections contain requirements that relate to this Section:

1. Glazing requirements, including windows specified to be factory glazed, are specified in Section 08800, "Glass and Glazing".

D. Work Specified Elsewhere:

1. Perimeter sealants installed after window units are in place is specified as work of Section 07900, "Joint Sealers".

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. General: Provide aluminum window units that comply with performance requirements specified, including optional performance classes where indicated, as demonstrated by testing manufacturer's corresponding stock systems according to test methods indicated.

B. Design Requirements: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA 101 for type, grade, and performance class of window units required.

1. Optional Performance Class Requirements: Where the required design pressure exceeds the minimum for the specified window grade, comply with requirements of AAMA 101, Section 3, "Optional Performance Classes" for higher than minimum performance class.
2. Design wind velocity at the project site is 90 mph for windows less than 40 feet above finish grade (measured to window centerline), and 110 mph for windows 40 or more feet above grade.

C. Testing: Test each type and size of required window unit through a recognized independent testing laboratory or agency, in accordance with ASTM E 330 for structural performance, with ASTM E 283 for air infiltration, and with ASTM E 547 for water penetration. Provide certified test results.

1. For windows of optional performance class rating C-45, test each type of unit in accordance with both ASTM E 331 and ASTM E 547 for water penetration.
2. Structural Performance: Provide window units with no failure or permanent deflection in excess of 0.4 percent of any member's span after removal of the imposed load, for the following test pressures:

    a. Windows less than 40 feet above grade to centerline: Positive (inward) and negative (outward) test pressure of 30 lbs/sq. ft.
    b. Windows more than 40 feet above grade to centerline: Positive (inward) test pressure of 50 lbs/sq. ft. and negative (outward) test pressure of 50 lbs/sq. ft.

3. Air Infiltration: Provide units with air infiltration rate of not more than 0.37 cfm/ft. of operable sash joint for an inward test pressure of 1.57 lbf/sq. ft.
4. Water Penetration: Provide units with no water penetration as defined in the test method at the following inward test pressures:

    a. Windows less than 40 feet above grade to centerline: 6.75 lbs/sq. ft.
    b. Windows more than 40 feet above grade to centerline: 9.75 lbs/sq. ft.

5. Condensation Resistance: Provide units that have been tested for thermal performance in accordance with AAMA 1503.1 showing a condensation resistance factor (CRF) of 48 or greater.
6. Thermal Transmittance: Provide window units that have a U-value maximum of 0.60 BTU/hour/sq. ft./deg F at 15-mph exterior wind velocity, when tested in accordance with AAMA 1503.1.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

1. Product data for each type of window required, including:
    a. Construction details and fabrication methods.
    b. Profiles and dimensions of individual components.
    c. Data on hardware, accessories, and finishes.

2. Shop drawings for each type of window required. Include information not fully detailed in manufacturer's standard product data and the following:
    a. Layout and installation details, including anchors.
    b. Elevations of continuous work at 1/4-inch scale and typical window unit elevations at 3/4-inch scale.
    c. Glazing details.
    d. Accessories.

3. Colors: Samples for selection purposes in the form of manufacturer's color charts for specified finish.
4. Certification: Provide certification by a recognized independent testing laboratory or agency showing that each type, grade, and size of window unit complies with performance requirements indicated.

1.5 QUALITY ASSURANCE:

A. Standards: Requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA 101 and applicable general recommendations published by AAMA.

B. Single-Source Responsibility: Provide aluminum window units from one source and produced by a single manufacturer.

C. Design Concept: The drawings indicate the sizes, profiles, and dimensional requirements of the aluminum window types required and are based on Graham Architectural Products Series 3200 and 3400. Minor variations from drawings required to use a manufacturer's standard window system will be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect.

D. Field Mock-ups: Furnish and install window units in mock-up assemblies for review and approval included as work of Sections 04200 and 07241.

1. Coordinate with work of indicated sections to deliver

and install units in mock-ups in a timely manner.

1.6 PROJECT CONDITIONS:

A. Field Measurements: Check actual window openings by accurate field measurement before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit of window units.

1.7 WARRANTY:

A. Aluminum Window Warranty: Submit a written warranty, executed by the window manufacturer, agreeing to repair or replace window units that fail in materials or workmanship within the specified warranty period. Failures include but are not necessarily limited to:

1. Structural failures including excessive deflection, excessive leakage, or air infiltration.
2. Faulty operation of sash and hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Failure of insulating glass unit as defined in Section 08800.

B. Warranty Period: 3 years after the date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Acorn Building Components, Inc.
2. EFCO Corporation.

3. Graham Architectural Products Corp.
4. Kawneer Company, Inc.

2.2 MATERIALS:

A. Aluminum Extrusions: Provide alloy and temper recommended by the window manufacturer for the strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.062 inch thick at any location for main frame and sash members.

B. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

   1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard noncorrosive pressed-in splined grommet nuts.
   2. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.

D. Sliding-Type Weatherstripping: Provide woven pile weatherstripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701.2.

   1. Provide stripping with integral center-line barrier fin of semirigid plastic sheet of polypropylene.

E. Sealant: For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

F. Wire Fabric Insect Screen: Provide 18 by 18, 18 by 16, or 18 by 14 mesh of 0.013-inch-diameter black color-anodized aluminum wire, complying with FS RR-W-365, Type VII.

2.3 ALUMINUM INSULATED PANELS:

A. General: Provide manufacturer's standard 1 inch laminated aluminum-faced panels for incorporation into window framing in lieu of glazing. Comply with the following:

1. Face and Back Sheets: Not less than 0.0249 inch thick, finish to match window frame members.
2. Edge conidiotn: Prepared for installation in window glazing channel.
3. Insulating Core: Rigid closed-cell urethane, polyisocyanurate, or extruded polystyrene board, at manufacturer's option.

B. Performance: Panels shall be fabricated to withstand indicated wind loading without failure.

C. Tolerances: Flat, rigid, with no deviation exceeding 1/32 inch in 4'-0".

2.4 HARDWARE:

A. General: Provide the manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

B. Limit Device: Provide the manufacturer's standard concealed, positive stop limit device designed to restrict the clear opening to 8" on windows with sill elevations less than 24" above finish floor.

C. Counterbalancing Mechanism: Comply with AAMA 902.2.

1. Sash Balance Type: Concealed tape spring type of size and capacity to hold sash stationary at any open position.

2.5 ACCESSORIES:

A. General: Provide the manufacturer's standard accessories that comply with indicated standards.

B. Insect Screens: Provide insect screens for each operable exterior sash or ventilator. Design windows and hardware to accommodate screens in a tight-fitting removable arrangement, with a minimum of exposed fasteners and latches.

1. Screen Frames: Fabricate frames of tubular-shaped extruded or formed aluminum members of 0.040-inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match

window units. Provide removable PVC spline-anchor concealing the edge of the screen frame.

C. Weatherstripping: Provide sliding-type weatherstripping where sash rails slide horizontally or vertically along the unit frame.

   1. Provide weatherstripping locked in to extruded grooves in the sash.

2.6 WINDOWS:

A. Window Grade and Class: Provide window units that comply with requirements of AAMA Grade and Performance Class indicated, including operating force and deglazing test requirements specified in AAMA 101:

   1. Windows less than 40 feet above finish grade to centerline: Class DH-C-35.
   2. Windows greater than 40 feet above finish grade to centerline: Class DH-HC-45.
   3. Provide window units with sash that can be removed from the inside for cleaning.

B. Hardware: Provide the following equipment and operating hardware:

   1. Sash Balances: Manufacturer's standard type (2 per sash).
   2. Lock: Cam action sweep lock and keeper on the meeting rail.
   3. Lift Handle: Continuous integral sash lift bar on bottom rail of lower sash.
   4. Limit Device: On operable sashes with sills less than 32" above finish floor, install limit devices to prevent sash from opening more than 7".

2.7 FABRICATION:

A. General: Fabricate aluminum window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units.

   1. Provide units that are reglazable without dismantling sash or framing.

B. Thermal-Break Construction: Fabricate window units with an integral concealed low-conductance thermal barrier, located between exterior materials and window members exposed on the interior, in a manner that eliminates direct metal-to-metal contact.

1. Weepholes: Provide weepholes and internal passages to conduct infiltrating water to the exterior.
2. Subframes: Provide subframes with anchors for window units, of profile and dimensions indicated but not less than 0.062-inch-thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units.
3. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, in the manner indicated.

C. Preglazed Fabrication: Preglaze window units at the factory where possible and practical for applications indicated. Comply with glass and glazing requirements of the "Glass and Glazing" sections of these specifications and AAMA 101.

D. Window Cleaning: Provide units with both fixed and operable sash removable from the inside for cleaning without disassembly of sash or framing.

2.8 FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Baked Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.5 mils, medium gloss.
2. Color: As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Inspect openings before beginning installation. Verify that rough or masonry opening is correct, sill plate is level, and that indicated sill flashing is installed.

   1. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.
   2. Metal surfaces shall be dry; clean; free of grease, oil, dirt, rust and corrosion, and welding slag; without sharp edges or offsets at joints.

B. Do not begin installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION:

A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of the work.

B. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.

   1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with the requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101.

C. Set sill members and other members in a bed of compound or with joint fillers or gaskets, to provide weathertight construction. Coordinate installation with wall flashings and other components of the work.

   1. Compounds, joint fillers, and perimeter joint sealers to be installed after installation of window units are specified as work in Section 07900, "Joint Sealers".

3.3 ADJUSTING:

A. Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.

3.4 CLEANING:

A. Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

B. Clean glass of preglazed units promptly after installation of windows. Comply with requirements of the "Glass and Glazing" section for cleaning and maintenance.

3.5 PROTECTION:

A. Initiate and maintain protection and other precautions required through the remainder of the construction period, to ensure that window units will be free of damage or deterioration at the time of Substantial Completion.

END OF SECTION 08520

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Hinges.
2. Spring hinges.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Bolts.
6. Exit devices.
7. Closers.
8. Door trim units.
9. Protection plates.
10. Weatherstripping.
11. Astragals or meeting seals on pairs of doors.
12. Thresholds.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05500, "Metal Fabrications", for steel courtyard gates to receive hardware.
2. Section 08100, "Standard Steel Doors and Frames", for silencers integral with hollow metal frames and factory preparation of doors and frames for door hardware.
3. Section 08200, "Wood Doors", for factory preparation of doors for door hardware.
4. Section 16000, "Electrical", for wiring of electric locks and strikes.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

   1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

      a. Type, style, function, size, and finish of each hardware item.
      b. Name and manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
      e. Explanation of all abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for hardware.
      g. Door and frame sizes and materials.

   2. Submittal Sequence: Submit initial draft of final schedule along with essential product data in order to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit final schedule after samples, product data, coordination with shop drawings of other work, delivery schedules, and similar information has been completed and accepted.
   3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

   1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.4 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.5 PRODUCT HANDLING:

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

C. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.6 MAINTENANCE:

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following. The manufacturer whose products are included in hardware schedule is indicated by an asterisk:

1. Butts and Hinges:

   a. Bommer Industries, Inc.
   b. Hager Hinge Co.

   c. Lawrence Brothers, Inc.
   d. *Stanley Hardware, Div. Stanley Works.

2. Cylinders and Locks:

   a. Best Lock Corp.
   b. Sargent Manufacturing Company.
   c. *Schlage Lock, Div. Ingersoll-Rand Door Hardware Group.
   d. Yale Security Inc.

3. Bolts:

   a. Glynn-Johnson Corp.
   b. Hager Hinge Co.
   c. *H. B. Ives, A Harrow Company.
   d. Stanley Hardware, Div. Stanley Works.

4. Exit/Panic Devices:

   a. Sargent Manufacturing Company.
   b. *Von Duprin, Div. Ingersoll-Rand Door Hardware Group.
   c. Yale Security Inc.

5. Overhead Closers:

   a. International Door Closers, Inc.
   b. *LCN, Div. Ingersoll-Rand Door Hardware Group.
   c. Norton Door Controls, Div. Yale Security Inc.
   d. Rixson-Firemark, Div. Yale Security Inc.
   e. Sargent Manufacturing Company.
   f. Yale Security Inc.

6. Door Trim Units:

   a. Baldwin Hardware Corp.
   b. Brookline Industries, Div. Yale Security Inc.
   c. Builders Brass Works Corp.
   d. Hager Hinge Co.
   e. *H. B. Ives, A Harrow Company.
   f. Triangle Brass Manufacturing Company (Trimco).

7. Kick, Mop, and Armor Plates:

   a. Baldwin Hardware Corp.
   b. Brookline Industries, Div. Yale Security Inc.
   c. Corbin & Russwin Architectural Hardware, Div. Black & Decker Corp.
   d. Hager Hinge Co.
   e. Hiawatha, Inc.
   f. *H. B. Ives, A Harrow Company.
   g. Triangle Brass Manufacturing Company (Trimco).

8. Door Stripping and Seals:

   a. Hager Hinge Co.
   b. *National Guard Products, Inc.
   c. Pemko Manufacturing Co., Inc.
   d. Reese Enterprises, Inc.
   e. Sealeze Corp.
   f. Ultra Industries.
   g. Zero International, Inc.

9. Thresholds:

   a. Hager Hinge Co.
   b. *National Guard Products, Inc.
   c. Pemko Manufacturing Co., Inc.
   d. Reese Enterprises, Inc.
   e. Sealeze Corp.
   f. Zero International, Inc.

10. Astragals:

   a. Hager Hinge Co.
   b. *National Guard Products, Inc.
   c. Pemko Manufacturing Co., Inc.
   d. Reese Enterprises, Inc.
   e. Zero International, Inc.

2.2 SCHEDULED HARDWARE:

A. Requirements for design, grade, function, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the approved comparable product of one of the other manufacturers that complies with requirements.

B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.

2.3 HINGES, BUTTS, AND PIVOTS:

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Materials: Furnish hinge units of the following materials:

1. Exterior Doors and Areas of High Moisture: Stainless steel units.
2. Interior doors: Polished steel in indicated finish.
3. Paint grade hinges will not be accepted.

C. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.
2. For wood doors install wood screws.
3. For fire-rated wood doors install #12 x 1-1/4-inch, threaded-to-the-head steel wood screws.
4. Finish screw heads to match surface of hinges or pivots.

D. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Out-Swing Exterior Doors: Nonremovable pins.
2. Out-Swing Corridor Doors with Locks: Nonremovable pins.
3. Interior Doors: Nonrising pins.
4. Tips: Flat button and matching plug, finished to match leaves.

E. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf.

2.4 LOCK CYLINDERS AND KEYING:

A. Standard System: Except as otherwise indicated, provide new masterkey system for Project.

B. Equip locks with manufacturer's special 6-pin tumbler cylinder with construction masterkey feature that permits voiding of construction keys without cylinder removal.

   1. Cylinders: All cylinders shall be removable and interchangeable using only the masterkey.

C. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

D. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

   1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."

E. Key Material: Provide keys of nickel silver only.

F. Key Quantity: Furnish 3 change keys for each lock and 5 master keys for each master system.

   1. Deliver keys to Owner.
   2. Provide hinged-panel type key control cabinet for wall mounting.

2.5 LOCKS, LATCHES, AND BOLTS:

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

   1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.
   2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
   3. Provide roller type strikes where recommended by manufacturer of the latch and lock units.

B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

   1. Provide 1/2-inch minimum throw of latch for other bored and preassembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.

C. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

1. Furnish one pair flush bolts for each scheduled door.

D. Rabbeted Doors: Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

2.6 PUSH/PULL UNITS:

A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation, thru-bolted for matched pairs but not for single units.

2.7 CLOSERS AND DOOR CONTROL DEVICES:

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.

1. Provide parallel arms for all overhead closers, except as otherwise indicated.

B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

C. Provide grey resilient parts for exposed bumpers.

2.8 DOOR TRIM UNITS:

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate edge trim of stainless steel to fit door thickness in standard lengths or to match height of protection plates.

C. Fabricate protection plates not more than 1-1/2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.

1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage).

2.9 WEATHERSTRIPPING AND SEALS:

A. General: Provide continuous weatherstripping on all exterior doors and on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

C. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface applied and of following metal, finish, and resilient bumper material:

1. Extruded aluminum with natural anodized finish, 0.062-inch minimum thickness of main walls and flanges.
2. Solid neoprene conforming to MIL R 6855, Class II, Grade 40 with flexible, hollow bulb insert.

D. Weatherstripping at Door Bottoms: Provide type scheduled, and of following materials:

1. Extruded aluminum with natural anodized finish, 0.062-inch minimum thickness of main walls and flanges.
2. For interior door sweeps, flexible solid vinyl wiper sweep.
3. For exterior openings at flat saddle thresholds, concealed solid vinyl molded bulb unit mounted to door bottom.

2.10 THRESHOLDS:

A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.

1. Finish: Furnish units with fluted aluminum finish for slip resistance.

B. Hinged or Pivoted Doors: Provide units not less than 4 inches wide, fabricated to accommodate door hardware and to fit door frames, with mitered and closed ends where required, and as follows:

1. Accessibility: Thresholds at common doors shall not exceed 3/8" in height unless otherwise indicated.
2. Provide units with thermal break, rabbet stop and neoprene bulb insert, at locations indicated.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."
4. Lockset and latchset mounting height: Unless otherwise indicated, mount lock and latchsets 36" above finish floor to centerline of lever or knob.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

1. Door Bottoms and Sweeps: Set units to properly contact floor or threshold, provide tight seal, and operate without binding or excessive force.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING:

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

3.3 HARDWARE SCHEDULE:

A. General: Provide hardware for each door to comply with requirements of this Section, hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

1. Hardware sets indicate quantity, item, manufacturer and product designation, and size as applicable.
2. Lockset Designs: Provide the Schlage lockset and latchset designs designated below, or if by another manufacturer, one that matches those designated:
    - a. F Series: Levon (LEV).
    - b. D Series: Rhodes (RHO).
3. Finishes: Unless otherwise indicated, furnish all items in BHMA finish 630 (formerly US32D) - Satin Stainless Steel, or Stainless Steel #4 polish, as applicable.

B. HARDWARE SET NO. 1
(Tower Street Entry Exterior Vestibule Pair)

Both doors active; passage sets. For each door, furnish the following:

Hinges:	4 1/2" x 4 1/2", Stanley FBB 199
Latchset:	D170-RHO (dummy trim).
Push Plate:	4 inches by 12 inches.
Closer:	LCN 4114H-Cush.
Bottom:	NGP 312.

For door opening, furnish the following:

Threshold:	Barrier free, NGP 613.
Weatherstrip:	NGP FS162A.
Meeting Stile Weatherstrip:	NGP 116N.

C. HARDWARE SET NO. 2
(Tower Street Entry Interior Vestibule Pair)

Both doors active; remote electric and keyed entry. For each door, furnish the following:
Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Exit Device: VD EL3347-L-F with NL function.
Cylinder: Schlage 20-001.
Closer: LCN 4114H-Cush.
Bottom: NGP 312.
Door Stop: Ives 401 1/2.

For door opening, furnish the following:
Threshold: Barrier free, NGP 413.
Weatherstrip: NGP FS162A.
Meeting Stile Weatherstrip: NGP 116N.

D. HARDWARE SET NO. 3
(Tower Courtyard Entry Exterior Vestibule)

Passage set; furnish the following:
Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Latchset: D170-RHO (dummy trim).
Push Plate: 4 inches by 12 inches.
Closer: LCN 4114H-Cush.
Bottom: NGP 312.
Door Stop: Ives 401 1/2.
Threshold: Barrier free, NGP 613.
Weatherstrip: NGP FS162A.

E. HARDWARE SET NO. 4
(Tower Courtyard Entry Interior Vestibule)

Remote electric and keyed entry:
Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Lockset: D80RD-RHO.
Electric Strike: Schlage 10-201EU.
Closer: LCN 4114H-Cush.
Bottom: NGP 312.
Door Stop: Ives 401 1/2.
Threshold: Barrier free, NGP 413.
Weatherstrip: NGP FS162A.

F. HARDWARE SET NO. 5
(Lowrise Street Entry Stair - C Label)

Remote electric and keyed entry:
Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Lockset: D80RD-RHO.
Electric Strike: Schlage 10-201EU.
Closer: LCN 4114H-Cush.

Threshold: NGP 8435 with vinyl bulb insert.
Weatherstrip: NGP FS162A.
Door Stop: Ives 401 1/2.

G. HARDWARE SET NO. 6
(Tower Commercial Space Exterior Entry)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Lockset: D50RD-RHO.
Dead Bolt: B460R.
Closer: LCN 4040.
Bottom: NGP 312.
Threshold: Barrier free, NGP 613.
Weatherstrip: NGP FS162A.

H. HARDWARE SET NO. 7
(Tower Fire Stair Egress - B Label)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Exit Device: VD 22K-F.
Cylinder: 20-001
Closer: LCN 4040.
Bottom: NGP 312.
Threshold: Barrier free, NGP 613.
Weatherstrip: NGP FS162A.

I. HARDWARE SET NO. 8
(Lowrise Courtyard Fire Stair Egress - B Label)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Lockset: D80RD-RHO.
Closer: LCN 4114-Cush.
Bottom: NGP 312.
Threshold: Barrier free, NGP 613.
Weatherstrip: NGP FS162A.

J. HARDWARE SET NO. 9
(Apartment Unit Street Entry)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Lockset: D50RD-RHO.
Dead Bolt: B460R.
Sweep: NGP 200N.
Threshold: NGP 8435 with vinyl bulb insert.
Weatherstrip: NGP FS162A.
Door Stop: Ives 401 1/2.
Viewer: Ives 696.

K. HARDWARE SET NO. 10

(Apartment Unit Courtyard Entry)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Lockset: D73RD-RHO.
Dead Bolt: B460R.
Sweep: NGP 200N.
Threshold: Barrier free, NGP 613.
Weatherstrip: NGP FS162A.
Door Stop: Ives 401 1/2.

L. HARDWARE SET NO. 11
(Trash Room Exterior Pair - B Label)

One door active; keyed locking. For active door, furnish the following:
Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Latchset: D80RD-RHO with knurled finish.
Bottom: NGP 312.
Door Stop: Ives 401 1/2.
Astragal: NGP 139SS.

For inactive door, furnish the following:
Hinges: 4 1/2" x 4 1/2", Stanley FBB 199
Dummy Trim: D170-RHO with knurled finish.
Bottom: NGP 312.
Flush Bolts: Ives 458.
Door Stop: Ives 401 1/2.

For door opening, furnish the following:
Threshold: Barrier free, NGP 613.
Weatherstrip: NGP FS162A.

M. HARDWARE SET NO. 12
(Interior Tenant Separation Door - C Label)

Hinges: 1/2 pr. 4 1/2" x 4 1/2", Stanley FBB 179.
1 pr. 4 1/2" x 4 1/2", Stanley 2060.
Lockset: D50RD-RHO.
Sweep: NGP FS102A.
Threshold: Barrier free, NGP 413.
Door Stop: Ives 401 1/2.

N. HARDWARE SET NO. 13
(Interior Office Door)

Hinges: 4 1/2" x 4 1/2", Stanley F179.
Lockset: D50RD-RHO.
Door Stop: Ives 401 1/2.

O. HARDWARE SET NO. 14

(Lavatory Door)

Hinges: 4 1/2" x 4 1/2", Stanley F191.
Lockset: D40S-RHO.
Door Stop: Ives 401 1/2.

P. HARDWARE SET NO. 15
(Storeroom Door)

Hinges: 4 1/2" x 4 1/2", Stanley F191.
Lockset: D80RD-RHO.
Door Stop: Ives 401 1/2.
Closer: LCN 4040.
Holder: Ives 452-4.
Kick Plate: Ives 8400; 10" high.

Q. HARDWARE SET NO. 16
(Pair Office Doors)

One door active; keyed locking. For active door, furnish the following:
Hinges: 4 1/2" x 4 1/2", Stanley F179.
Latchset: D50RD-RHO.
Door Stop: Ives 401 1/2.

For inactive door, furnish the following:
Hinges: 4 1/2" x 4 1/2", Stanley F179
Dummy Trim: D170-RHO.
Flush Bolts: Ives 458.
Door Stop: Ives 401 1/2.

R. HARDWARE SET NO. 17
(Mail Room Door)

Hinges: 4 1/2" x 4 1/2", Stanley F179.
Lockset: Cylinder lock approved by USPS.
Door Stop: Ives 401 1/2.

S. HARDWARE SET NO. 18
(Tower Fire Stair - B Label)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 179.
Latchset: D10S-RHO.
Closer: LCN 4040.
Sweep: NGP FS102A.
Threshold: Barrier free, NGP 413.
Door Stop: Ives 401 1/2.

T. HARDWARE SET NO. 19

(Lowrise Fire Stair - B Label)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 179.
Lockset: D73RD-RHO.
Sweep: NGP FS102A.
Threshold: Barrier free, NGP 413.
Closer: LCN 4040.
Door Stop: Ives 401 1/2.

U. HARDWARE SET NO. 20
(Mechanical and Electrical Rooms - B Label)

Hinges: 4 1/2" x 4 1/2", Stanley FBB 179.
Lockset: D80RD-RHO with knurled finish.
Sweep: NGP FS102A.
Threshold: Barrier free, NGP 413.
Closer: LCN 4040.
Door Stop: Ives 401 1/2.
Holder: Ives 452-4.

V. HARDWARE SET NO. 21
(Emergency Electrical Closet Pair - B Label)
(Fire Control Center and Electrical Closet - C Label)

One door active; keyed locking. For active door, furnish the following:
Hinges: 4 1/2" x 4 1/2", Stanley FBB 179.
Lockset: D80RD-RHO.
Sweep: NGP FS102A.
Closer: LCN 4040.
Door Stop: Ives 401 1/2.
Astragal: NGP 139SS (at outside face).
Holder: Ives 452-4.

For inactive door, furnish the following:
Hinges: 1/2 pr. 4 1/2" x 4 1/2", Stanley FBB 179.
1 pr. 4 1/2" x 4 1/2", Stanley 2060.
Dummy Trim: D170-RHO.
Sweep: NGP FS102A.
Closer: LCN 4040.
Flush Bolts: Ives 458.
Door Stop: Ives 401 1/2.
Holder: Ives 452-4.

For door opening, furnish the following:
Threshold: Barrier free, NGP 413.

W. HARDWARE SET NO. 22
(Trash and Laundry Room - C Label)

Hinges: 1/2 pr. 4 1/2" x 4 1/2", Stanley FBB 179.

1 pr. 4 1/2" x 4 1/2", Stanley 2060.
Latchset: D10S-RHO.
Threshold: Barrier free, NGP 413.
Door Stop: Ives 401 1/2.

X. HARDWARE SET NO. 23
(Interior Apartment Entry Door - C Label)

Hinges: 1/2 pr. 4 1/2" x 4 1/2", Stanley FBB 179.
1 pr. 4 1/2" x 4 1/2", Stanley 2060.
Lockset: D73RD-RHO.
Sweep: NGP FS102A.
Threshold: Barrier free, NGP 413.
Weatherstrip: NGP FS162A.
Door Stop: Ives 401 1/2.
Knocker/Viewer: Ives 771-700, with engraved number.

Y. HARDWARE SET NO. 24
(Apartment Bedroom Door)

Hinges: 3 1/2" x 3 1/2", Stanley 1900.
Latchset: F10N-LEV.
Door Stop: Ives 401 1/2.

Z. HARDWARE SET NO. 25
(Apartment Bath Door)

Hinges: 3 1/2" x 3 1/2", Stanley 1960.
Privacy Set: F40N-LEV.
Door Stop: Ives 401 1/2.

AA. HARDWARE SET NO. 26
(Apartment Closet Hinged Door)

Hinges: 3 1/2" x 3 1/2", Stanley 1900.
Dummy Trim: F170N-LEV.
Door Stop: Ives 401 1/2.
Roller Catch: Ives 333, mounted at jamb.

AB. HARDWARE SET NO. 27
(Apartment Closet Hinged Pair)

For each door furnish the following:
Hinges: 3 1/2" x 3 1/2", Stanley 1900.
Dummy Trim: F170N-LEV.
Door Stop: Ives 401 1/2.
Roller Catch: Ives 333, mounted at head.

AC. HARDWARE SET NO. 28
(Courtyard Gate - Egress Hardware)

Furnish the following:
Hinges: 5" x 6", Stanley BB852, quantity as required per manufacturer.
Lockset: Adams Rite MS+1890 Deadlock with 4560 Lever at outside and 4590 Exit Paddle device at interior.

END OF SECTION 08710

SECTION 08800 - GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work in this section include glass and glazing for:

1. Window units, not indicated as "preglazed".
2. Entrances and other doors, not indicated as "preglazed".
3. Transoms, sidelights, and borrowed lights.

C. Related Sections: The following sections contain requirements that relate to this Section:

1. Glazing in factory-glazed aluminum windows is included in Section 8520, "Aluminum Windows", in accordance with requirements of this Section.

D. Work Specified Elsewhere:

1. Mirror glass is specified in Section 10800, "Toilet and Bath Accessories".

1.3 SYSTEM DESCRIPTION:

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 deg. F (67 deg. C) and from a consequent temperature range within glass and glass framing members of 180 deg. F (100 deg. C).
2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which

results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

B. Samples: Submit, for verification purposes, 12" square samples of each type of glass indicated except for clear single pane units, and 12" long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color.

C. Certificate: Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

1. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

D. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.

1.5 QUALITY ASSURANCE:

A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire Resistance Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E 163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC).
2. Associated Laboratories, Inc. (ALI).

E. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:

1. AFG Industries, Inc.
2. Environmental Glass Products.
3. Falconer Glass Industries.
4. Ford Glass Division.
5. Guardian Industries Corp.

6. Hordis Brothers, Inc.
7. Independent Insulating Glass.
8. Pilkington Sales (North America) Limited.
9. PPG Industries, Inc.
10. Saint-Gobain/Euroglass.
11. Spectrum Glass Prod. Div., H. H. Robertson Co.

2.2 GLASS PRODUCTS, GENERAL:

A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.3 PRIMARY GLASS PRODUCTS:

A. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).

B. Wired Glass: Type II (patterned and wired glass, flat), Class 1 (clear), Quality q8 (glazing); complying with ANSI Z97.1; 1/4" thick; of form and mesh pattern indicated below:

   1. Polished Wire Glass: Form 1 (wired, polished both sides), Mesh m2 (square).

2.4 HEAT-TREATED GLASS PRODUCTS:

A. Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.

   1. Kind FT (fully tempered) where indicated.

2.5 SEALED INSULATING GLASS UNITS:

A. General: Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and dessicant.

1. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.
2. Provide heat-treated (fully tempered) panes of kind and at locations indicated as follows:

    a. At all glazing less than 18" above finish floor surface.
    b. At all glazing within 18" (measured horizontally) from a door opening, or glazing within doors.
    c. Other locations where recommended by manufacturer for application indicated or where safety glass is designated or required.

3. Performance characteristics designated for insulating glass are nominal values based on manufacturer's published test data for units with 1/4" thick panes of glass and 1/2" thick air space.
4. Performance Classification per ASTM E 774: Class A.
5. Thickness of Each Pane: 1/4".
6. Air Space Thickness: 1/2".
7. Sealing System: Dual seal; primary and secondary sealant: manufacturer's standard materials.
8. Spacer Material: Manufacturer's standard metal.
9. Dessicant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.

B. Low Emissivity-Coated Insulating Glass Units: Manufacturer's standard units with one pane of glass coated with a durable, neutral-colored, low-emissivity metallic coating, of type and on surface indicated, and complying with the following requirements.

1. Exterior Pane: Clear float glass, coated on second surface.
2. Interior Pane: Clear float glass, uncoated.
3. Coating Type: Vacuum deposited.
4. Performance Characteristics: Visible light transmittance of 63 percent, summer daytime U-value of 0.34, winter nighttime U- value of 0.31, shading coefficient of 0.47 and outdoor reflectance of 11 percent.

2.6 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES:

A. General: Provide products of type indicated and complying with the following requirements:

   1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
   2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
   3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
   4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

B. One-Part Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25; Uses NT, G, and A, complying with the requirements for modulus indicated below.

   1. Compatibility: If recommended by the insulating glass unit manufacturer, substitue the following sealant on insulating glass units, complying with the same requirements:

      a. One-Part Non-Acid-Curing Silicone Glazing Sealant: Type S; Grade NS, Class 25; Uses NT, G, and A.

   2. Medium Modulus: Tensile strength of not less than 45 nor more than 75 psi at 100 percent elongation when tested per ASTM D 412 after 14 days at 77 deg. F (20 deg. C) and 50 percent relative humidity.

C. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side.

D. Available Products: Subject to compliance with requirements, glazing sealants which may be incorporated in the work include, but are not limited to, the following:

   1. One-Part Acid-Curing Silicone Glazing Sealant:

  - a. "Chem-Calk 1200"; Bostik Construction Products Div.
  - b. "Dow Corning 999"; Dow Corning Corp.
  - c. "SCS 1200"; General Electric Corp.
  - d. "863"; Pecora Corp.
  - e. "Proglaze"; Tremco.

2. One-Part Non-Acid Curing Medium-Modulus Silicone Glazing Sealant:

   - a. "Dow Corning 795"; Dow Corning Corp.
   - b. "Silpruf"; General Electric Corp.
   - c. "Gesil"; General Electric Corp.
   - d. "Spectrum 2"; Tremco, Inc.

3. Preformed Butyl-Polyisobutylene Glazing Tape Without Spacer Rod:

   - a. "Chem-Tape 40"; Bostik Construction Products Div.
   - b. "Extru-Seal"; Pecora Corp.
   - c. "PTI 303" Glazing Tape; Protective Treatments, Inc.
   - d. "Tremco 440 Tape"; Tremco Inc.

2.7 GLAZING GASKETS:

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of material indicated below, complying with ASTM C 864, of profile and hardness required to maintain watertight seal:

   1. Neoprene.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

   1. D. S. Brown Co.
   2. Maloney Precision Products Co.
   3. Tremco.

2.8 MISCELLANEOUS GLAZING MATERIALS:

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.3 GLAZING, GENERAL:

A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants.

3.4 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.

F. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.

I. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.5 PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.

D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

END OF SECTION 08800

SECTION 09250 - GYPSUM DRYWALL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Underwriters Laboraties Inc.'s "Fire Resistance Directory", edition current at time of contract, is incorporated in the Contract Documents by reference to specific "UL" assembly designations on drawings. Comply with all UL requirements of indicated assembly, unless more stringent requirements are indicated.

1.2 SUMMARY:

A. Extent of each type of gypsum drywall construction required is indicated on Drawings.

B. This Section includes the following types of gypsum board construction:

1. Interior steel framing members and exterior soffit framing members to receive gypsum board.
2. Gypsum board screw-attached to steel framing and furring members.

C. This Section includes extensive use of gypsum drywall assemblies for fireproofing applications. The Contractor may at his option substitute sprayed-on fireproofing specified in Section 07250, complying with requirements indicated, provided overall system performance and appearance are not affected.

D. Related Sections: The following sections contain requirements that relate to this Section:

1. Batt insulation and vapor retarders installed in gypsum assemblies are specified in Section 07210, "Building Insulation".
2. Firestopping sealants and fillers for penetrations in gypsum assemblies are specified in Section 07270, "Firestopping".

E. Work Specified Elsewhere:

1. "C" shaped steel studs for exterior wall framing are specified in Section 05400, "Cold-Formed Metal Framing".
2. Exterior gypsum sheathing is specified in Section 09262, "Gypsum Sheathing".
3. Gypsum board shaft walls are specified in Section 09270, "Gypsum Board Shaft Wall Systems".

1.3 DEFINITIONS:

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.4 SUBMITTALS:

A. Product data from manufacturers for each type of product specified.

1.5 QUALITY ASSURANCE:

A. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

    1. Provide fire-resistance-rated assemblies identical to those indicated by reference to design designations in U.L. "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.

B. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Minimum Room Temperatures: Maintain not less than 40 deg F (4 deg C) for 48 hours prior to application and continuously thereafter until drying is complete.

C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials form drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. Steel Framing and Furring:
    a. Bostwick Steel Framing Co.
    b. Dale Industries, Inc.
    c. Gold Bond Building Products Div., National Gypsum Co.
    d. Incor, Inc.
    e. Marino Industries Corp.
    f. United States Gypsum Co.
2. Gypsum Boards and Related Products:
    a. Domtar Gypsum Co.
    b. Georgia-Pacific Corp.
    c. Gold Bond Building Products Div., National Gypsum Co.
    d. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS:

A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.

B. Concrete Inserts: Inserts designed for attachment to concrete forms and for embedment in concrete, fabricated from corrosion-resistant materials, with holes or loops for attachment of hanger wires and capability to sustain, without failure, a load equal to 3 times that imposed by ceiling construction, as determined from testing per ASTM E 488, conducted by an independent testing laboratory.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Channels: Cold-rolled steel, 0.0598 inch minimum thickness of base (uncoated) metal and 7/16 inch wide flanges, protected with rust-inhibitive paint, and as follows:

1. Carrying Channels: 1-1/2 inch deep, 475 lbs per 1000 ft., unless otherwise indicated.

F. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 0.0179 inch, unless otherwise indicated.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to form 3/16" minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 0.0179 inch (25 gage), unless otherwise indicated.
2. Depth: 2-1/2 inches, unless otherwise indicated.

B. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth and minimum thickness of base (uncoated) metal as follows:

1. Depth: 7/8 inch.
2. Thickness: 0.0179 inch, unless otherwise indicated.

C. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

D. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.

2.4 GYPSUM BOARD:

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.

   1. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, in either 1/2 inch or 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.

B. Gypsum Wallboard: ASTM C 36, and as follows:

   1. Type: Regular, unless otherwise indicated.
   2. Type: Type X for fire-resistance-rated assemblies.
   3. Edges: Tapered.
   4. Thickness: 1/2 inch, unless otherwise indicated.
   5. Thickness: 5/8 inch where indicated.

C. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, and as follows:

   1. Type: Type X for fire-resistance-rated assemblies.
   2. Edges: Manufacturer's standard.
   3. Thickness: 1/2 inch, unless otherwise indicated.

D. Water-Resistant Gypsum Backing Board: ASTM C 630, and as follows:

   1. Type: Regular, unless otherwise indicated.
   2. Type: Type X for fire-resistance-rated assemblies.
   3. Thickness: 1/2 inch or 5/8 inch as indicated.

E. Exterior Gypsum Soffit Board: ASTM C 931, with manufacturer's standard edges, of type and thickness indicated below:

   1. Type: Regular, unless otherwise indicated.
   2. Type: Type X for fire-resistance rated assemblies.
   3. Thickness: 5/8 inch, unless otherwise indicated.

2.5 TRIM ACCESSORIES:

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal or metal combined with paper, with metal complying with the following requirement:
    a. Sheet steel zinc-coated by hot-dip process, for screw attachment.
2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:
    a. "L" Bead, for screw attachment and flat finish, unless otherwise indicated.
3. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

B. Metal Edge Trim for Exterior Ceilings: Comply with the following requirements:

1. Edge trim complying with ASTM C 1047, formed from rolled zinc, shape "LC" Bead per Fig. 1, unless otherwise indicated.

2.6 GYPSUM BOARD JOINT TREATMENT MATERIALS:

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.

C. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mix Formulation: Factory-premixed product.
2. All-purpose compound formulated for use as both taping and topping compound.

2.7 MISCELLANEOUS MATERIALS:

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.

B. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.

C. Gypsum Board Screws: ASTM C 1002.

   1. Size: 1 1/4 inches, unless otherwise indicated.

D. Asphalt Felt: ASTM D 226, Type I (No. 15), complying with requirements specified in Section 06100, "Rough Carpentry".

E. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant.

F. Finish Sealant: Comply with requirement specified in Section 07900, "Joint Sealers".

G. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining glass or slag mineral fibers with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing) and for use in fire-rated assembly partitions.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Ceiling Anchorages: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

B. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required provide continuous units fastened to building structure not more than 24 inches o.c. and to ceiling runners.

C. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of drywall construction. Protect fireproofing that remains from damage.

3.3 INSTALLATION OF STEEL FRAMING, GENERAL:

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

1. Install blocking for grab bars at residential bathrooms in all residential flats, whether or not indicated to receive grab bars.
2. Coordinate location of blocking and supplementary framing with work of other trades to ensure adequate support and proper placement.

C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on Drawings:

1. Where partition and wall framing abuts overhead structure.
2. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
3. Fill voids at slip joints with compressible firestopping filler.

D. Where partition and wall framing runs parallel to metal deck fluting and does not bridge flutes, install flat metal closure plates to deck before installing stud track.

1. At fire-rated assemblies fill voids between deck and stud track with approved firestopping.

3.4 INSTALLATION OF STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS:

A. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to cast-in concrete inserts or other anchorage devices or fasteners as indicated.

   1. Do not attach hangers to metal deck tabs or metal roof deck.

B. Do not connect or suspend steel framing from ducts, pipes or conduit.

C. Keep hangers and braces 2 inches clear of ducts, pipes and conduits.

D. Sway-brace suspended steel framing with hangers used for support.

E. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.

   1. Hangers: 0.1620 inch diameter (8 gage) wire or 1-1/2 inch channels, 4 ft. on center.
   2. Carrying Channels (Main Runners): 1-1/2 inch, 24 inches on center.
   3. Rigid Furring Channels (Furring Members): 24 inches on center.
   4. At locations indicated to receive two layers of gypsum board, install rigid furring channels at 12" on center.

F. Installation Tolerances: Install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within 1/8 inch in 12 ft. as measured both lengthwise on each member and transversely between parallel members.

G. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

H. For exterior soffits provide cross-bracing and additional framing indicated or required to resist wind uplift.

3.5 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other construction.

   1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than 1/8 inch from plane of faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

D. Install steel studs and furring in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.

 1. For single layer construction: 16 inches on center.

E. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.

F. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

 1. Double all vertical jamb studs.

G. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

3.6 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.

B. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board has been installed.

C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.

D. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24 inches.

E. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At finish walls higher than the maximum available gypsum board dimension, install boards horizontally with end joints staggered over studs.

F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

G. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

H. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

I. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

J. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.

K. Form control joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.

L. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

   1. Except where concealed application is indicated or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75 percent of full coverage.
   2. Fit gypsum board around ducts, pipes, and conduits.

M. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2 inch space and trim edge with "L" bead edge trim. Seal joints with acoustical sealant.

N. Where sound-rated drywall construction is indicated, seal construction at perimeters, control joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.

O. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.7 METHODS OF GYPSUM BOARD APPLICATION:

A. Single-Layer Application: Install gypsum wallboard as follows:

1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

B. Wall Tile Base: Where drywall is base for thin-set ceramic tile and similar rigid applied wall finishes, install water-resistant gypsum backing board to comply with ASTM C 840 and recommendations of gypsum board manufacturer.

C. Double-Layer Application: Install gypsum backing board for base layer and gypsum wallboard for face layer.

1. On ceilings apply base layer prior to application of base layer on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10 inches. Apply base layers at right angles to supports unless otherwise indicated.
2. On partitions/walls apply base layer and face layers vertically (parallel to framing) with joints of base layer over supports and face layer joints offset at least 10 inches with base layer joints.

D. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten with screws.

E. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:

1. Fasten both base layers and face layers separately to supports with screws.

F. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board perpendicular to supports, with end joints staggered over supports. Install with 1/4 inch open space where boards abut other construction and finish with indicated trim accessory.

1. Fasten with cadmium-plated screws.
2. Install control joints as indicated on drawings, or if not indicated, at 16'-0" on center.

3.8 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound.

1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install "L" bead where edge trim can only be installed after gypsum board is installed.

D. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

E. Install H-molding in exterior gypsum drywall construction where control joints are indicated.

3.9 FINISHING OF DRYWALL:

A. Do not begin drywall finishing until firestopping work is completed.

B. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

C. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.

D. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

E. Finish interior gypsum wallboard by applying all-purpose joint compound in 3 coats (not including prefill of openings in base), and sand between coats and after last coat.

F. Finish exterior gypsum soffit board by using setting-type joint compounds to prefill joints, embed tape, and to apply first, fill (second) and finish (third) coats; smooth each coat before joint compound hardens to minimize need for sanding; sand between coats and after finish coat.

G. Water-Resistant Gypsum Backing Board Base for Ceramic Tile: Comply with ASTM C 840 and manufacturer's recommendations for treatment of joints behind tile.

1. Maintain indicated assembly fire rating.

H. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

I. Seal gaps, crevices, and locations where gypsum board abuts adjacent construction, complying with installation methods specified in Section 07900, "Joint Sealers".

1. Apply indicated sealant at penetrations and locations where wallboard abuts structure to maintain required fire or acoustic performance ratings. Use materials and in joint widths to accomodate expected structural movement.

3.10 PROTECTION:

A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

END OF SECTION 09250

SECTION 09262 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following types of gypsum sheathing construction:

1. Gypsum sheathing and glass-fiber-faced gypsum sheathing screw-attached to "C" shaped exterior steel stud framing.
2. Moisture infiltration barriers stapled to exterior sheathing.

B. Gypsum sheathing work is field-installed and in prefabricated panelized EIFS wall systems included in Section 07241, "Exterior Insulation and Finish Systems - Class PB".

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each type of product specified, including the following:

1. Gypsum sheathing products.
2. Moisture infiltration barrier.
3. Mastic sealants.

1.4 QUALITY ASSURANCE:

A. Fire-Resistance Ratings: Where indicated, provide materials whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

B. Single Source Responsibility: Obtain each type of gypsum sheathing from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack flat to prevent sagging.

C. Handle gypsum sheathing to prevent damage to edges, ends, and surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. Domtar Gypsum Co.
2. Georgia-Pacific Corp.
3. Gold Bond Building Products Div., National Gypsum Co.
4. United States Gypsum Co.

2.2 GYPSUM SHEATHING:

A. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face, back, and long edges with water-repellent paper; complying with ASTM C 79 and requirements indicated below:

1. Type: Regular (not Type X), unless otherwise indicated.
2. Type: Type X (with special fire-resistant properties), where required to achieve indicated fire resistance assemblies.
3. Edge and End Configuration: Square.
4. Thickness: 1/2 inch for regular sheathing.
5. Thickness: 5/8 inch, for Type X sheathing.
6. Size: 4 feet by 10 feet unless otherwise indicated.
7. Application: Behind brick veneer finish and as indicated.

B. Available Products: Subject to compliance with requirements, gypsum sheathing boards that may be incorporated in the Work include, but are not limited to, the following:

1. Gypsum Sheathing Board with Water-Resistant Core, Regular Type:
    a. "Gyproc Gypsum Sheathing," Domtar Gypsum Co.
    b. "G-P Gypsum Sheathing," Georgia-Pacific Corp.
    c. "Gold Bond Gypsum Sheathing," Gold Bond Building Products Div., National Gypsum Co.
    d. "USG Gypsum Sheathing," United States Gypsum Co.

2. Gypsum Sheathing Board with Water-Resistant Core, Type X:
    a. "Gyproc Fireguard Sheathing," Domtar Gypsum Co.
    b. "G-P Firestop Sheathing," Georgia-Pacific Corp.
    c. "Gold Bond Fire Shield Jumbo Sheathing," Gold Bond Building Products Div., National Gypsum Co.
    d. "USG Firecode Type X Gypsum Sheathing," United States Gypsum Co.

C. Glass-Fiber-Surfaced Gypsum Sheathing Board: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face and back with inorganic glass fiber mats and alkali-resistant coating, and with unsurfaced square edges; complying with ASTM C 79, and requirements indicated below:

1. Type: Regular (not Type X), unless otherwise indicated.
2. Type: Type X (with special fire-resistant properties), where required to achieve indicated fire resistant assemblies.
3. Thickness: 1/2 inch for regular sheathing.
4. Thickness: 5/8 inch for Type X sheathing.
5. Size: 4 feet by 10 feet, or as indicated.
6. Application: As substrate for exterior insulation and finish system.

D. Available Products:

1. Regular Type: "Dens-Glass Gold", Georgia-Pacific Corp.
2. Type X: "Dens-Glass Firestop Gold", Georgia-Pacific Corp.

2.3 MOISTURE INFILTRATION BARRIER:

A. Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.

2.4 FASTENERS AND ACCESSORIES:

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Gypsum Sheathing Screws: 1-1/4 inch of type recommended by sheathing manufacturer for attachment to 14 to 18 gage framing, cadmium-coated bugle head screws, for exterior use.
2. Staples: Corrosion-resistant.

B. Mastic Sealant: Polyisobutylene; non-hardening, nonskinning, nonmigrating sealant.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates to which sheathing attaches or abuts, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATION OF GYPSUM SHEATHING:

A. Application: Install regular gypsum sheathing at locations indicated to receive brick veneer or other masonry finish. Install glass-fiber sheathing at locations indicated to receive exterior insulation and finish system specified in another Section.

1. Install Type X (fire-rated) sheathing at locations where fire-resistance rating is required.

B. General: Install gypsum sheathing, fastened to face of stud framing as indicated, using specified fasteners.

1. Keep perimeter fasteners 3/8 inch from edges and ends of boards. Fit boards tightly against each other and around openings.

C. Install 4-foot by 10-foot sheathing vertically with long edges parallel to, and centered over, studs. Install continuous stud blocking where end joints do not bear against framing sills or plates. Screw fasten to each support to comply with manufacturer's recommended spacing, but space fasteners not more than 6 inches o.c. around perimeter at edge and end supports and 8 inches o.c. at intermediate supports.

1. Coordinate panel application and fastener spacing with exterior insulation and finish system work specified in Section 07241.

D. Install board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

E. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

1. Fit gypsum board around cutouts and openings.

F. Form control joints and expansion joints at locations indicated, with space between edges of boards. Do not bridge sheathing board across joints in stud framing where provision is made for movement.

3.3 MOISTURE INFILTRATION BARRIER:

A. General: Install moisture infiltration barrier at sheathing indicated to receive brick masonry veneer finish as recommended by manufacturer and as follows:

1. Install moisture barrier immediately after installation of gypsum sheathing board.

B. Install asphalt-saturated organic felt barrier horizontally, lapping minimum of 6 inches over layer below and 6 inch endlap; fasten to sheathing with corrosion-resistant staples.

1. Apply adhesive mastic to end lap seams and around penetrations in barrier.
2. Extend infiltration barrier to cover upturned cavity wall flashing and shelf angles with a minimum 6 inch overlap and apply mastic to secure in place.

C. At window sills, jambs, and other openings, extend barrier onto stud return and secure in place.

D. Control and Movement Joints: Extend infiltration barrier across control joints, leaving slack in paper to accommodate expected thermal movement. Staple fasten to sheathing at 6 inches o.c. on either side.

END OF SECTION 09262

SECTION 09270 - GYPSUM BOARD SHAFT WALL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This section includes the following applications for gypsum board shaft wall systems:

1. Service shaft enclosures (for piping, ductwork, air plenums, electrical, and similar services).
2. Trash chute enclosures.

B. Gypsum drywall construction for applications other than shaft walls and application and finishing of regular gypsum board in shaft wall assemblies is specified in Section 09250, "Gypsum Drywall."

1.3 SYSTEM DESCRIPTION:

A. Performance Requirements, General: Provide gypsum board shaft wall systems complying with performance requirements specified, as demonstrated by pretesting manufacturer's corresponding stock systems.

B. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies, including those incorporating elevator door and other framing, whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

1. Provide fire-resistance rated assemblies identical to those indicated by reference to design designations in UL "Fire Resistance Directory" or in listings of other testing and inspecting agencies acceptable to authorities having jurisdiction.

C. Structural Performance Characteristics: Provide gypsum board shaft wall systems engineered to withstand the following lateral design loadings (air pressures), applied transiently and cyclically, for maximum heights of partitions required, within the following deflection limits, verified by pretesting for deflection characteristics:

1. Lateral Loading: 7.5 psf.
2. Deflection Limit: 1/240 of partition height.

D. Sound Attenuation Performance: Provide gypsum board shaft wall systems designed and pretested to achieve the following minimum ratings for sound transmission class (STC) per ASTM E 90.

1. STC Rating: 39.

1.4 SUBMITTALS:

A. Product data from manufacturers for each type of gypsum board shaft wall system specified.

B. Product test reports indicating and interpreting test results relative to compliance of gypsum board shaft wall systems with fire resistance, structural performance and acoustical performance requirements.

C. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction which evidence system's compliance with requirements and with building code in effect for Project.

1.5 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain products for gypsum board shaft wall systems from a single manufacturer for each type of system indicated.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads, trim, track, and studs.

1.7 PROJECT CONDITIONS:

A. Comply with requirements for environmental conditions, room temperatures and ventilation specified in Section 09250, "Gypsum Drywall."

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. Domtar Gypsum Co.
2. Georgia Pacific Corporation.
3. Gold Bond Building Products Div., National Gypsum Co.
4. United States Gypsum Co.

2.2 BASIC SYSTEM MATERIALS:

A. General: Provide standard materials and components listed in manufacturer's published product literature for gypsum board shaft wall systems of type and application indicated.

1. Provide gypsum boards in maximum lengths available to eliminate or minimize end-to-end butt joints and in thickness required to produce assemblies complying with structural and other performance requirements.

B. Steel Framing: ASTM C 645, of profile, size, and base metal thickness required to produce assemblies complying with structural performance requirements, with sectional properties computed to conform with AISI "Specification for Design of Cold-Formed Steel Structural Members."

C. Gypsum Shaftwall Board: ASTM C 442, Type X liner panel or coreboard designed for shaft wall construction, with moisture-resistant paper facings.

D. Gypsum Wallboard: ASTM C 36, Type X, and as follows:

1. Edges: Tapered.

E. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, Type X, edge configuration as standard with manufacturer.

F. Trim Accessories: Provide cornerbeads, edge trim and control joints of material and, for edge trim, shapes specified in Section 09250, "Gypsum Drywall", and complying with ASTM C 1047 and gypsum board shaft wall manufacturer's recommendation for application indicated.

G. Gypsum Wallboard Joint Treatment Materials: Provide materials complying with ASTM C 475, ASTM C 840, recommendations of gypsum board shaft wall manufacturer for the application indicated, and as specified in Section 09250, "Gypsum Drywall."

H. Miscellaneous Materials: Provide auxiliary materials for gypsum board shaft wall systems of the type and grade recommended by the manufacturer of the system and as follows:

1. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum boards of type indicated.
2. Gypsum Board Screws: ASTM C 1002.
3. Runner Fasteners: Low-velocity tool-driven fasteners of type, size and material required to withstand loading conditions imposed on shaft wall system without exceeding allowable design stress of runner, fastener or structural substrate in which anchor is embedded.
4. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, gunnable synthetic rubber sealant complying with requirements specified in Section 09250.
5. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.
6. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining glass or slag mineral fibers with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).

2.3 BASIC SYSTEM DESCRIPTION:

A. General: Provide complete shaft wall systems which comply with requirements indicated.

B. Cavity Shaft Wall Systems: Provide assemblies consisting of gypsum shaft wall boards inserted between U- or J-shaped metal floor and ceiling tracks; with specially shaped studs engaged in tracks and fitted between shaftwall boards; and gypsum boards on finished side or sides applied to studs in number of layers, thicknesses and arrangement indicated.

1. Shaftwall Board Thickness: 1 inch.
2. Stud Shape: C-H.
3. Stud Thickness: 0.0179 inch min. thickness of base metal.
4. Stud Depth: 2-1/2 inch.

5. Room-Side Finish: Two layers 1/2 inch thick gypsum board as indicated.
6. Cavity Insulation: Provide sound attenuation blankets in cavity formed by studs between shaftwall board and room-side finish.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates which gypsum board shaft wall construction attaches to or abuts including cast-in-anchors and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of shaft wall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches o.c. and to ceiling runners.

B. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of shaft wall systems. Protect fireproofing that remains from damage. Comply with shaft wall manufacturers requirements for replacement of fireproofing as required to re-establish its continuity.

3.3 INSTALLATION OF GYPSUM BOARD SHAFT WALL SYSTEMS:

A. General: Install gypsum board shaft wall systems to comply with performance and other requirements indicated as well as with manufacturer's installation instructions and the following:

1. ASTM C 754 for installation of steel framing.
2. Section 09250 "Gypsum Drywall" for application and finishing of gypsum wallboard.

B. Install supplementary framing, blocking and bracing to support gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported directly by regular framing of gypsum board shaft wall system.

C. Coordinate gypsum board shaft wall construction with sprayed-on fireproofing of the structure, so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during the installation of the shaft wall system.

D. At penetrations in shaft wall, maintain fire resistance rating of entire shaft wall assembly by installing supplementary fire protection behind boxes containing wiring devices and similar items.

E. Isolate shaft wall system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Comply with details shown and with manufacturer's instructions.

F. Seal gypsum board shaft walls at perimeter of each section which abuts other work and at joints and penetrations within each section. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; comply with manufacturer's instructions and ASTM C 919.

3.4 PROTECTION:

A. Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures gypsum board shaft wall system construction being without damage or deterioration at time of Substantial Completion.

END OF SECTION 09270

SECTION 09300 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Alternates: The unglazed ceramic mosaic tile work of this Section is referenced in an Alternate. See Section 01030, "Alternates".

1.2 SUMMARY:

A. This Section includes the following:

1. Unglazed ceramic mosaic tile with glazed tile base.
2. Unglazed quarry tile.
3. Stone thresholds.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 01030, "Alternates", for alternative floor finishes in unit bathrooms.
2. Section 07900, "Joint Sealants", for sealing of control and isolation joints in tile surfaces.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout, stone thresholds and accessories involving color selection.

D. Samples for verification purposes of each item listed below, in sets showing full range of variations expected.

1. At least 4 units of each type of tile and for each color required.
2. At least 2 stone threshold samples in 6-inch lengths.

E. Master grade certificates for each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Field-Constructed Mock-Up: Before installing tile, erect mock-up to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-up to comply with the following requirements, using materials indicated for final unit of Work.

1. Install a mock-up of one full residential bathroom including tile patterns (if any), grout, and joint sealants.
2. Demonstrate the proposed range of aesthetic effects and workmanship.
3. Obtain Architect's acceptance of mock-up before start of final unit of Work.
4. Retain and maintain mock-up during construction in undisturbed condition as a standard for judging completed unit of Work.

    a. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS:

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.7 EXTRA MATERIALS:

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

1. Quarry Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

2. Unglazed Ceramic Mosaic Tile and Base Units: Furnish quantity of full-size units equal to amount required to install one full residential bathroom.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Unglazed Ceramic Mosaic Tile:

    a. American Olean Tile Co., Inc.
    b. Dal-Tile Corp.
    c. Mid-State Tile Co.
    d. Monarch Tile Manufacturing, Inc.
    e. Summitville Tiles, Inc.
    f. United States Ceramic Tile Co.

2. Unglazed Quarry Tile:

    a. American Olean Tile Co., Inc.
    b. Dal-Tile Corp.
    c. Mid-State Tile Co.
    d. Summitville Tiles, Inc.
    e. Wenczel Tile Co. of Florida

3. Latex-Emulsion-Based Latex-Portland Cement Mortars:

    a. American Olean Tile Co., Inc.
    b. Bostik Construction Products Div.
    c. DAP Inc. Div.; USG Corp.
    d. Laticrete International Inc.
    e. Southern Grouts & Mortars, Inc.
    f. Summitville Tiles, Inc.
    g. Syracuse Adhesives Co.

4. Commercial Portland Cement Grouts:

    a. American Olean Tile Co., Inc.
    b. Bostik Construction Products Div.
    c. Custom Building Products
    d. Southern Grouts & Mortars, Inc.
    e. Syracuse Adhesives Co.

5. Acrylic Emulsions for Latex-Portland Cement Grouts:

    a. American Olean Tile Co., Inc.
    b. Bostik Construction Products Div.
    c. Custom Building Products
    d. DAP Inc. Div.; USG Corp.
    e. Laticrete International Inc.
    f. Southern Grouts & Mortars, Inc.
    g. Summitville Tiles, Inc.
    h. Syracuse Adhesives Co.

6. Waterproofing Membrane for Unglazed Ceramic Mosaic Tile: By the same manufacturer as and compatible with the specified latex-portland cement mortar.
7. Glazed Tile Base for Unglazed Ceramic Mosaic Tile: By the same manufacturer as and compatible with the specified latex-portland cement mortar.
8. Sealer for Quarry Tile: By the manufacturer of the specified quarry tile.

2.2 PRODUCTS, GENERAL:

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. Colors and Textures: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, and other appearance characteristics, provide specific products or materials compling with the following requirements:

1. Provide selections made by Architect from manufacturer's full range of standard colors and textures for products of type indicated.
2. Unglazed Ceramic Mosaic Tile Colors: For pricing purposes assume one low to moderate price-range field color and two moderate to high price-range pattern/accent colors for project.
3. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

2.3 TILE PRODUCTS:

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:

1. Composition: Porcelain.
2. Nominal Facial Dimensions: 2 inches by 2 inches.
3. Nominal Thickness: 1/4 inch.
4. Face: Plain with cushion edges.

B. Unglazed Quarry Tile: Provide square-edged flat tile complying with the following requirements:

1. Wearing Surface: Plain.
2. Nominal Facial Dimensions: 6 inches by 6 inches.
3. Nominal Thickness: 1/2 inch.
4. Face: Plain.
5. For latex-portland cement mortared quarry tile, precoat with temporary protective coating.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.

   a. Base for mosaic tile: 2 inches high by 6 inches long, nominal.
   b. Base for quarry tile: 4 inches high by 6 inches long, nominal.

2. Shapes: As follows, selected from manufacturer's

standard shapes:

a. Base: Straight with surface bullnose top.
b. Base External Corners: Surface bullnose.
c. Internal Corners: Field-butted square corners, designed to member with stretcher shapes.

2.4 STONE THRESHOLDS:

A. General: Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.

1. Provide thinnest availabe units for thinset (non-recess) application, with bevel edges to meet tile and carpet finishes.
2. Size: 3-1/2 inches wide by full width of door opening.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.

1. Provide white, honed marble complying with MIA Group "A" requirements for soundness.

2.5 WATERPROOFING FOR THINSET TILE INSTALLATIONS:

A. Latex Rubber Waterproofing: Manufacturer's standard factory- prepackaged, job-mixed, proprietary two-part formulation consisting of liquid latex rubber and powder for trowel application and glass fiber fabric reinforcing.

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

1. "Laticrete 301/335 Waterproof Membrane"; Laticrete International Inc.

2.6 SETTING MATERIALS:

A. Latex-Portland Cement Mortar: ANSI A118.4, composition as follows:

1. Latex additive (water emulsion) of type described below, serving as replacement for part or all of gauging water, combined at job site with prepackaged dry mortar mix supplied or specified by latex additive manufacturer.

   a. Latex Type: Manufacturer's standard.

B. Commercial Portland Cement Grout: ANSI A118.6, color as indicated, for grouting quarry tile application.

C. Latex-Portland Cement Grout: ANSI A118.6, color as indicated, composition as follows, for grouting unglazed ceramic mosaic tile applications:

1. Latex additive (water emulsion) serving as replacement for part or all of gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:

   a. Latex Type: Manufacturer's standard.
   b. Dry Grout Mixture: Commercial portland cement specified or supplied by latex additive manufacturer.

2.7 MISCELLANEOUS MATERIALS:

A. Temporary Protective Coating: If recommended by tile manufacturer for use with indicated mortar or grout, provide product formulated to protect exposed surfaces of tile against adherence of mortar and grout, compatible with tile and mortar/grout products, and easily removable after grouting is completed without damaging grout or tile.

B. Permanent Protective Sealer for Quarry Tile: Provide manufacturer's standard water-based acrylic sealer recommended for installation on unglazed quarry tile.

2.8 MIXING MORTARS AND GROUT:

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

B. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION, GENERAL:

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

1. Unglazed Cermaic Mosaic Tile Method: TCA F122.
2. Quarry Tile Method: TCA F113.

C. Extend tile work into recesses and under or behind cabinetry, equipment and fixtures to form a complete covering without interruptions. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor and base are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Stone Thresholds: Install stone thresholds centered in door openings; thinset with abutting field tile unless otherwise indicated.

1. Cut to fit in door opening, scribing as required at door stop.

G. Control and Isolation Joints: Locate sealant-filled joints, including control and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.

H. Install matching base and trim units, aligning with joint coursing in floors.

I. Grout tile to comply with the requirements of ANSI A108.10.

3.4 WATERPROOFING FOR THINSET TILE INSTALLATIONS:

A. Install waterproofing in compliance with waterproofing manufacturer's instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

1. Extend waterproofing fully under built-in fixtures, including tub/shower units and water closets, and turn up walls a minimum of 1-1/2 inches to create a fully waterproof enclosure.
2. Install fabric reinforcing at corners.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CLEANING AND PROTECTION:

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Install finish sealer on completed quarry tile in accordance with manufacturer's directions.

D. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.

   1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
   2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09300

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes acoustical panel ceilings installed with exposed suspension systems.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 15 Section "Fire Protection" for sprinkler heads in acoustical ceilings.
2. Division 16 Section "Interior Lighting Fixtures" for lighting fixtures in acoustical ceilings.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of product specified.
2. Coordination drawings for reflected ceiling plans drawn accurately to scale and coordinating penetrations and ceiling-mounted items. Show the following:

   a. Ceiling suspension members.
   b. Method of attaching hangers to building structure.
   c. Ceiling-mounted items including light fixtures and sprinkler heads; and other junctures with adjoining construction.

3. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual acoustical units or sections of units showing full range of colors, textures, and patterns available for each type of unit indicated.
4. Samples for verification purposes of each type of exposed finish required, prepared on 6-inch-square sample of each acoustical panel type, pattern, and color.

1.4 QUALITY ASSURANCE:

A. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.

   a. Flame Spread: 15 or less.
   b. Smoke Developed: 15 or less.

2. Fire-Resistance Ratings: As indicated by reference to design designations in UL "Fire Resistance Directory," for types of assemblies in which acoustical ceilings function as a fire- protective membrane and tested per ASTM E 119. Protect lighting fixtures to comply with requirements indicated for rated assembly.

B. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling component from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

C. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment (if any) and fire-suppression system components.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS:

A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.7 EXTRA MATERIALS:

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 5.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Materials and Manufacturers: For the purpose of establishing a standard of quality and appearance, a single product has been specified. Other products will be accepted if, in the opinion of the Architect, they are substantially equal in performance and appearance to that specified.

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

1. Mineral-Base Panels - Molded mineral fiber units, solid color, with fine texture surface pattern, Fire-Resistance Rated Panels and approved for UL Design Number G228:

    a. "Acoustone Fire Code Frost" with "Shadowline" edge, USG Interiors, Inc.

2. Fire-Resistance-Rated Suspension Systems: Exposed, with reveal:

    a. "DXL 24 System", USG Interiors, Inc.

2.2 MINERAL-BASE ACOUSTICAL PANELS - MOLDED:

A. Type, Form, and Finish: Provide Type III, Form 1 units per ASTM E 1264 with painted finish that comply with pattern and other requirements indicated.

B. Lightly Textured Pattern: Units fitting ASTM E 1264 pattern designation G, with other characteristics as follows:

1. Light Reflectance Coefficient: LR 0.80.
2. Color: Match color indicated by reference to manufacturers' standard color designations.
3. Noise Reduction Coefficient: NRC 0.70.
4. Ceiling Sound Transmission Class: CSTC 40.
5. Edge Detail: 3/4" wide reveal to fit flange of exposed semi-recessed grid members.
6. Size: 24 inches by 24 inches by 3/4 inch.

2.3 METAL SUSPENSION SYSTEMS, GENERAL:

A. Standard for Metal Suspension Systems: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.

1. Gage: Provide wire sized so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gage).

E. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit type of edge detail and suspension system indicated.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2.4 FIRE-RESISTANCE-RATED DIRECT-HUNG SUSPENSION SYSTEMS:

A. Wide-Face Capped Double-Web Steel Suspension System: Main and cross-runners roll-formed from prepainted or electrolytic zinc-coated cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Intermediate-Duty System.
2. Cap Material and Finish: Steel sheet painted in color other than white as selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION:

A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

   1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C 636.

B. Suspend ceiling hangers from building structural members and as follows:

   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Do not attach hangers to steel deck tabs. Attach hangers to structural members.
6. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.

D. Secure insulation units to acoustical panels with adhesive recommended by manufacturer.

E. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

1. Install hold-down clips in areas indicated and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

3.4 CLEANING:

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09650 - RESILIENT FLOORING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. This Section includes the following resilient flooring work:

1. Sheet vinyl floor coverings with fibrous backings.
2. Vinyl composition floor tile.
3. Vinyl wall base, stair treads, and accessories.

B. Extent of resilient flooring and accessories is shown on drawings.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

1. Certification by manufacturer that products supplied for resilient flooring installation comply with local regulations controlling use of volatile organic compounds (VOC's).

C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual sections of products showing full range of colors and patterns available for each type of resilient floor material indicated.

D. Samples for verification purposes in full-size tiles of each different color and pattern of resilient floor tile specified and sections not less than 6 inches by 9 inches of sheet and linear products, showing full range of variations expected in these characteristics.

E. Product certificates, in lieu of laboratory test reports signed by manufacturer certifying that each product complies with requirements.

F. Maintenance data for resilient floor tile, to include in

Operating and Maintenance Manual specified in Division 1.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Fire Performance Characteristics: Provide resilient floor tile with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
2. Smoke Density: Less than 450 per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver resilient flooring materials and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).

C. Store products on flat surfaces. Move materials and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS:

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive products specified in this Section for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).

B. Do not install products until they are at the same temperature as that of the space where they are to be installed.

C. Close spaces to traffic during installation of products specified in this Section.

1.7 SEQUENCING AND SCHEDULING:

A. Install resilient flooring and accessories after other finishing operations, including painting, have been completed.

B. Do not install resilient flooring over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.8 EXTRA MATERIALS:

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels clearly describing contents:

1. Not less than 1 standard carton of each different type and color of resilient wall base installed.
2. Not less than one box of each class, wearing surface, color, pattern and size of resilient floor tile installed.
3. A quantity of not less than one one percent of each type and color of resilient stair treads installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS:

A. Vinyl Composition Tile Products: Subject to compliance with requirements, vinyl composition floor tiles that may be incorporated in the Work include, but are not limited to, the following:

1. "Standard Excelon - Imperial Texture", Armstrong World Industries, Inc.
2. "Standard Excelon - Imperial Modern", Armstrong World Industries, Inc.
3. "Custom Cortina", Azrock Floor Products Div., Azrock Industries, Inc.
4. "Architectural Criterion", Kentile Floors, Inc.

B. Sheet Vinyl Products: Subject to compliance with requirements, sheet vinyl floor coverings that may be incorporated in the Work include, but are not limited to, the following:

1. "Classic Corlon Series", Armstrong World Industries, Inc.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of Vinyl Wall Base:

    a. Armstrong World Industries, Inc.
    b. Azrock Floor Products Div., Azrock Industries, Inc.
    c. Flexco Div., Textile Rubber Co.
    d. Johnson Rubber Co., Inc.
    e. Kentile Floors, Inc.
    f. Mercer Plastics Co., Inc.
    g. Vinyl Plastics Inc.

2. Manufacturers of Vinyl Treads:

    a. Flexco Div., Textile Rubber Co.
    b. Johnson Rubber Co., Inc.
    c. Mercer Plastics Co., Inc.
    d. R. C. Musson Rubber Co., Inc.
    e. R. C. A. Rubber Co.

2.2 RESILIENT FLOORING COLORS AND PATTERNS:

A. Provide colors and patterns as selected by Architect from manufacturer's standards.

2.3 RESILIENT TILE:

A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066, Composition 1 (nonasbestos formulated).

1. Size: 12 inches by 12 inches.
2. Gauge: 1/8 inch.

2.4 VINYL SHEET FLOORING:

A. Type I Sheet Vinyl Floor Coverings with Backing: Products complying with ASTM F 1303, Type I, and with the following requirements:

1. Type: No-wax fully-adhered sheet vinyl with inlaid color.
2. Minimum Gauge: 0.085".
3. Minimum Wear Layer: 0.050".
4. Minimum Roll Width: 6 feet.

5. Static Load Limit: 100 psi minimum as recommended by manufacturer.

B. Seam Sealer: Formulation approved or provided by floor covering manufacturer for products indicated.

2.5 RESILIENT WALL BASE:

A. Vinyl Wall Base: Provide vinyl base complying with FS SS-W-40, Type II, with site-fabricated corner units, and as follows:

1. Height: 4"
2. Thickness: 1/8" gage.
3. Style: Standard top-set cove.
4. Finish: Matte.

2.6 RESILIENT STAIR ACCESSORIES:

A. Resilient Stair Treads: Provide treads where shown, consisting of single-piece units for width of stair treads, or equal-length units if tread width exceeds available manufactured lengths.

1. Provide vinyl stair tread units complying with FS RR-T-650, Type B, sanded backs, style as indicated.
2. Thickness: Not less than 3/16" nominal and 1/4" at nosing.
3. Nose Design: Class 1 - round nose.

B. Stair Tread Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates not conforming to tread contours.

2.7 INSTALLATION ACCESSORIES:

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.

C. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.

D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. General: Examine areas where installation of resilient flooring and accessories will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with manufacturer's requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive resilient flooring.

B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

F. Use stair tread nose filler per tread manufacturer's directions to fill nosing substrates not conforming to tread contours.

3.3 INSTALLATION, GENERAL:

A. Install resilient flooring using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

1. Extend resilient flooring under base cabinets and kitchen appliances.

B. Scribe, cut, and fit resilient flooring to butt tightly to vertical surfaces, permanent fixtures, pipes, outlets and permanent columns, walls and nosings.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

D. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.

E. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

3.4 VINYL COMPOSITION TILE INSTALLATION:

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.

B. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in basket weave pattern with grain direction alternating between reversed in adjacent tiles.

3.5 SHEET VINYL INSTALLATION:

A. Lay out sheet vinyl floor coverings to comply with the following requirements:

1. Maintain uniformity of sheet vinyl floor covering direction.
2. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas.
3. Match edges of resilient floor coverings for color shading and pattern at seams.
4. Avoid cross seams.

B. Adhere sheet flooring to substrates using method approved by flooring manufacturer for type of sheet flooring and substrate condition indicated.

1. Use conventional full spread adhesive method unless otherwise indicated.

C. Prepare seams in vinyl sheet flooring in accordance with the manufacturer's instructions for most inconspicuous appearance, sealing continuously with fluid-applied sealant or adhesive as standard with manufacturer.

D. Hand roll sheet vinyl floor coverings in both directions from center out to embed floor coverings in adhesive and eliminate trapped air. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.

3.6 INSTALLATION OF ACCESSORIES:

A. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
2. Install inside and exterior corners before installing straight pieces.
3. Form inside corners on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.
4. Form outside corners on job from straight pieces of

maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base and only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of wall base.

B. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

C. Apply resilient accessories at stair as indicated and in strict accordance with manufacturer's installation instructions.

3.7 CLEANING AND PROTECTION:

A. Perform following operations immediately upon completion of resilient flooring:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by manufacturer.
4. Damp-mop resilient flooring and accessories to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of resilient product involved.

1. If recommended by manufacturer, apply protective floor polish to resilient flooring surfaces free from soil, excess adhesive or surface blemishes. Use commercially available metal cross-linked acrylic product acceptable to resilient flooring manufacturer.
2. Protect resilient flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors.
3. Cover resilient flooring and accessories with undyed, untreated building paper until inspection for Substantial Completion.

END OF SECTION 09650

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes carpet, installation, and accessories.

B. Colors: Furnish three (3) colors/patterns for the project.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of carpet material and installation accessory required. Submit written data on physical characteristics, durability, resistance to fading, and flame resistance characteristics.

C. Shop drawings showing typical layout and seaming diagrams. Indicate columns, doorways, enclosing walls or partitions, and locations where cutouts are required in carpet. Show installation details at special conditions.

D. Samples for selection and verification purposes in manufacturer's standard size, showing full range of color, texture, and pattern variations expected. Prepare samples from same material to be used for the Work. Submit the following:

1. 12-inch-square samples of each type of carpet material required.
2. 12-inch-long samples of each type exposed edge stripping and accessory item.
3. 6-inch-square samples of each type of cushion.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualification: Firm whose carpet materials comply with "Use of Materials Bulletin UM-44D" published by U.S. Department of Housing and Urban Development (HUD) and are currently listed in HUD "Certified Products Directory" and so identified by imprint on back of carpet.

B. Carpet Surface Burning Characteristics: Provide carpet tested for the following fire performance characteristics, per test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify carpet with appropriate markings of applicable testing and inspecting organization.

1. Test Method: DOC FF 1-70 / ASTM D 2859.
2. Rating: Pass.

C. Cushion Surface Burning Characteristics: Provide carpet cushion identical to that tested for the following fire performance characteristics, per test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify carpet cushions with appropriate markings of applicable testing and inspecting organization.

1. Test Method: DOC FF 1-70 / ASTM D 2859; Rating: Pass.
2. Test Method: ASTM E 84; Flame Spread: 25 or less; Smoke Developed: 450 or less.

C. Additional Test Standards: Provide carpet tested for the following additional performance characteristics, per test method indicated, by testing organization acceptable to authorities having jurisdiction.

1. Test Method: ASTM E 84; Smoke Developed: 200 or less.
2. Smoke Propagation: UL 992; 0.0 to 4.0 (Class B).
4. Floor Radiant Panel Test: ASTM E 648; minimum 0.22 watts per sq. cm. (Class II).

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

B. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, blocked off ground. Maintain minimum temperature of 68 deg F (20 deg C) at least three days prior to and during installation in area where materials are stored.

1.6 PROJECT CONDITIONS:

A. Substrate Conditions: No condensation within 48 hours on underside of 4-foot by 4-foot polyethylene sheet, fully taped at perimeter to substrate.

B. Substrate Conditions: pH of 9 or less when substrate wetted with potable water and pHydrion paper applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Carpet:
    a. Collins & Aikman, New York, NY.
    b. J & J Industries Inc., Dalton, GA.
    c. Lees Commercial Carpet, Greensboro, NC.
    d. Philadelphia Carpets.
    e. Stratton/Shaw Industries, Dalton, GA.

2. Carpet Cushion:
    a. Chris Craft Industries, Inc.
    b. General Felt Industries, Inc.
    c. Ludlow Carpet Cushion.
    d. Olin Corp., Omalon Carpet Foundation.
    e. Sponge Cushion Inc.
    f. Uniroyal, Inc.

2.2 CARPET CUSHION:

A. Cushion: Type II (cellular sponge rubber), Class II (heavy traffic), flat.

1. Weight: 64 oz.
2. Thickness: 0.250 inch plus 5 percent.
3. CLD at 25 percent: 1.00 psi.

2.3 ACCESSORIES:

A. Tackless Carpet Stripping: Water-resistant plywood in strips 9/32-inch thick, 2 rows or 3 rows, as indicated in Part 3 below, of angular pins protruding from top, designed to grip and hold stretched carpet at backing.

B. Carpet Edge Guard: Aluminum with fold-down edge and concealed gripper teeth; minimum 1-1/2-inch-wide punched anchorage flange; minimum 5/8-inch-wide fold flange. Anodized aluminum finish, manufacturer's standard colors.

1. Finish: Hammered texture.

C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Carpet Adhesive: Water resistant and nonstaining as recommended by carpet manufacturer to comply with flammability requirements for installed carpet.

E. Cushion Adhesive: Manufacturer's recommended mildew-resistant adhesive, produced expressly for use with selected carpet cushion on substrate.

2.4 CARPET:

A. General: Provide carpet meeting the following minimum criteria. Location for each type of carpet is indicated in "Carpet Schedule" in Part 3.

1. Construction and Style: Tufted level loop.
2. Filament: Continuous filament nylon, delustered.
3. Dye Method: Solution or yarn dyed.
3. Primary Backing: Woven Polypropylene.
4. Secondary Backing: 3.0 oz. per sq. yd. woven polypropylene, laminated with 2 lb. per sq. in. bond strength.

B. Type I Carpet: Installed with cushion; Class II (Heavy Traffic).

1. Yarn Weight: Minimum 26 oz. per sq. yd.
2. Yarn Density: Minimum 4000 denier.
3. Gauge: 1/10 inch.
4. Pile Height: 0.19 inch average.

C. Type II Carpet: Direct adhered; Class II (Heavy Traffic).

1. Yarn Weight: Minimum 28 oz. per sq. yd.
2. Yarn Density: Minimum 4000 denier.
5. Gauge and stitches: 1/10 inch by 9.2.
6. Pile Height: 0.37 inch average.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Concrete Slab Substrates: Clear away debris and scrape up cementitious deposits from concrete surfaces to receive carpet; apply sealer to prevent dusting.

3.2 INSTALLATION, GENERAL:

A. Comply with manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. Minimize number of seams and joints; use whole sections in single lengths wherever possible. At doorways, center seams under door in closed position; do not place seams perpendicular to door frame, in direction of traffic through doorway.

B. Extend carpet under removable flanges and furnishings and into alcoves and closets of each space.

C. Provide cutouts where required, and bind cut edges where not concealed by protective edge guards or overlapping flanges.

D. Install carpet edge guard where edge of carpet is exposed; anchor guards to substrate.

E. Install with pattern parallel to walls and borders.

F. Install carpet by trimming edges, butting cuts with seaming cement, and taping and/or sewing seams to provide sufficient strength for stretching and continued stresses during life of carpet.

G. Stretch carpet to provide smooth, ripple-free, taut, trim edges; secure to stripping and conceal behind edge of stripping. Use power stretcher where carpet length is greater than 20 feet.

3.3 INSTALLATION OF CARPET WITH CUSHION:

A. Install tackless carpet stripping by nailing. Locate to ensure concealment of carpet edge between stripping and base of wall. Lay strip at entire perimeter of carpeted space, obstructions, and cutouts. Provide narrow stripping with 2 rows of pins where stretched width of carpet is 20 feet or less; stripping with 3 rows of pins where carpet width exceeds 20 feet.

B. Install cushion seams at 90-degree angle with carpet seams. Place cushion face up as recommended by cushion manufacturer. Apply minimum 2-inch fabric-type adhesive tape on cushion seams.

1. In ramped floor areas, increase anchorage or adhesive. Bond carpet cushion to substrate.

3.4 INSTALLATION OF GLUE-DOWN CARPET:

A. Fit sections of carpet prior to application of adhesive. Trim edges and butt cuts with seaming cement.

B. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt edges tight to form seams without gaps. Roll entire area lightly to eliminate air pockets and ensure uniform bond.

3.5 CLEANING:

A. Remove adhesive from carpet surface with manufacturer's recommended cleaning agent.

B. Remove and dispose of debris and unusable scraps. Vacuum with commercial machine with face-beater element. Remove soil. Replace carpet where soil cannot be removed. Remove protruding face yarn.

C. Vacuum carpet.

3.6 PROTECTION:

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, to ensure carpet is not damaged or deteriorated at time of Substantial Completion.

3.7 CARPET SCHEDULE:

A. General: Provide carpet as scheduled. Type I carpet is installed with carpet strips and cushion; Type II carpet is direct-adhered to substrate.

B. Type I Carpet: At all areas inside living units scheduled to receive carpet except for five (5) barrier free units in tower.

C. Type II Carpet: At all other areas scheduled to receive carpet, including barrier free units in tower, commercial, office, and retail areas, and corridors.

END OF SECTION 09680

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 SUMMARY:

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

B. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

1. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, and exposed steel and iron work.

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

D. Related Sections: The following sections contain requirements that relate to this section:

1. Section 05120, "Structural Steel", for shop priming structural steel.
2. Section 05220, "Steel Joists", for shop priming joists.
3. Section 05500, "Metal Fabrications", for shop priming ferrous metal.
4. Section 07700, "Roof Accessories", for shop priming ferrous metal.
5. Section 08100, "Steel Doors and Frames", for shop priming steel doors and frames.
6. Section 08200, "Wood Doors", for shop priming wood doors.

1.3 SUBMITTALS:

A. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use.

   1. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.
   2. For each material, indicate application method and expected resulting dry film thickness (DFT).

B. Samples for initial color selection in the form of manufacturer's color charts.

   1. After color selection, the Architect will furnish color chips for surfaces to be coated.

C. Samples for verification purposes: Provide samples of each color and material to be applied, as follows:

   1. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
   2. Provide in-situ (field) samples on actual surfaces. Assume three (3) 4' x 8' samples for each wall color and two (2) samples for each trim or component color specified.

      a. Field samples shall be installed in locations selected by the Architect, on surfaces similar to those where each application is planned.
      b. Final acceptance of color selections will be from field samples.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

   1. Notify the Architect of problems anticipated using the materials specified.

C. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary paint materials specified here are for purpose of establishing product quality and system compatibility and are not intended to imply that products named are required or to exclude equal products of other manufacturers.

D. Air Quality Regulations: Use materials and installation methods that comply with applicable regulations established by authorities having jurisdiction.

1. Furnish VOC-compliant products where required.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Manufacturer's stock number and date of manufacture.
3. Contents by volume, for pigment and vehicle constituents.
4. Thinning instructions.
5. Application instructions.
6. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 JOB CONDITIONS:

A. Apply paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

   1. Devoe and Raynolds Co. (Devoe).
   2. Benjamin Moore and Co. (Moore).
   3. PPG Industries, Pittsburgh Paints (Pittsburgh).
   4. Pratt and Lambert (P & L).
   5. The Sherwin-Williams Company (S-W).

2.2 PRIMERS:

A. Interior Latex-Based Primer: Flat latex-based primer coating used over concrete and interior gypsum wall board under a flat latex paint or an alkyd flat or semigloss enamel:

   1. Moore: Moore's Latex Quick-Dry Prime Seal #201.

B. Synthetic, Rust-Inhibiting Primer: Quick-drying, rust-inhibiting primer for priming ferrous metal on the exterior under full-gloss alkyd enamel and on the interior under flat latex paint or odorless alkyd semigloss or alkyd gloss enamels:

   1. Moore: Ironclad Retardo Rust-Inhibitive Paint #163.

C. Alkyd-Type Zinc Chromate Primer: Lead-free primers used for priming ferrous metals on the exterior under high-gloss alkyd enamels.

   1. Devoe: 41839 Bar-Ox Zinc Chromate Primer.
   2. Glidden: 5205 Glid-Guard Tank & Structural Primer.
   3. P & L: Tech-Gard Zinc Chromate Primer E154.
   4. S-W: Zinc Chromate Primer B50Y1.

D. Galvanized Metal Primer: Primer used to prime interior and exterior zinc-coated (galvanized) metal surfaces:

   1. Devoe: 13201 Mirrolac Galvanized Metal Primer.
   2. Moore: Ironclad Galvanized Metal Latex Primer #155.

2.3 UNDERCOAT MATERIALS:

A. Interior Enamel Undercoat: Ready-mixed enamel for use on the interior as an undercoat over a primer on concrete or ferrous or zinc-coated metal under an odorless alkyd semigloss enamel or full gloss alkyd enamel:

1. Moore: Moore's Alkyd Enamel Underbody #217.

2.4 EXTERIOR FINISH PAINT MATERIAL:

A. General: Provide materials of same manufacturer as primers.

B. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for use over primed ferrous or primed zinc-coated (galvanized) metal surfaces:

1. Moore: Impervo High-Gloss Enamel #133.

C. Deep Color Alkyd High-Gloss Enamel: Deep color, ready-mixed alkyd paint for use over primed ferrous or primed zinc-coated (galvanized) metal surfaces:

1. Moore: Moore's House Paint #110

D. Semigloss Odorless Alkyd Enamel: Low-odor, semigloss, alkyd enamel for use over a primer on gypsum drywall soffits:

1. Moore: Moore's Satin Impervo Enamel #235.

2.5 INTERIOR FINISH PAINT MATERIAL:

A. Latex-Based Interior Flat Paint: Ready-mixed, latex-based paint for use as a flat finish over prime-coated gypsum drywall surfaces:

1. Moore: Regal Wall Satin #215.

B. Interior Semigloss Odorless Alkyd Enamel: Low-odor, semigloss, alkyd enamel for use over a primer and undercoat on concrete, wood, and hardboard and over prime-coated gypsum drywall:

1. Moore: Moore's Satin Impervo Enamel #235.

C. Alkyd gloss enamel for use over a primer and undercoat on interior ferrous and zinc-coated metal surfaces:

1. Moore: Impervo High-Gloss Enamel #133.

2.6 MISCELLANEOUS WOOD-FINISHING MATERIALS:

A. General: Provide the manufacturer's recommended factory formulated, wood finishing materials that are compatible with substrate and undercoats indicated.

B. Paste Wood Filler: Solvent-based air-drying, paste-type wood filler.

C. Low-lustre Polyurethane: Quick-drying, rosin-free, clear, general-purpose polyurethane finish.

1. Moore: Benwood Polyurethane Finish #435.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION:

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.

2. Cementitious Materials: Prepare concrete surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

   a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
   b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

   a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood.
   c. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

4. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

   a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

D. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION:

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in "Schedules" at end of this Section.
2. Provide finish coats that are compatible with primers used.
3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.
4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.

6. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
8. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
9. Omit primer on metal surfaces that have been shop-primed and touch up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to exposed items outside mechanical equipment rooms and in occupied spaces.

F. Mechanical items to be painted include but are not limited to:

1. Piping, pipe hangers, and supports.
2. Tanks.
3. Ductwork.
4. Supports.
5. Accessory items.

G. Electrical items to be painted include but are not limited to:

1. Conduit and fittings.

H. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Transparent Finishes: Apply two coats of specified polyurethane to provide an even smooth surface of uniform appearance and gloss.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 CLEANING:

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

3.5 PROTECTION:

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINT SCHEDULE:

A. General: Provide the following paint systems for the various substrates indicated. Primers may be the responsibility of other Sections.

B. Ferrous Metal: Primer is not required on shop-primed items.

1. Full-Gloss Alkyd Enamel: 2 coats over primer.

    a. Primer: Synthetic Rust-Inhibiting Primer.
    b. First Coat: Alkyd Gloss Enamel.
    c. Second Coat: Alkyd Gloss Enamel.

2. Deep Color, High-Gloss Alkyd Enamel: Two coats over

primer.

- a. Primer: Alkyd-Type Zinc Chromate Primer.
- b. First Coat: Deep Color Alkyd Resin Paint.
- c. Second Coat: Deep Color Alkyd Resin Paint.

C. Zinc-Coated Metal:

1. Deep Color, High-Gloss Alkyd Enamel: 2 coats over primer.

    - a. Primer: Galvanized Metal Primer.
    - b. First Coat: Deep Color Alkyd Resin Paint.
    - c. Second Coat: Deep Color Alkyd Resin Paint.

3.7 INTERIOR PAINT SCHEDULE:

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Concrete:

1. Semigloss Enamel Finish: 3 coats with total dry film thickness not less than 3.5 mils.

    - a. Primer: Latex-Based Interior Flat Paint.
    - b. Undercoat: Interior Enamel Undercoat.
    - c. Finish Coat: Interior Semigloss Odorless Alkyd Enamel.

C. Gypsum Drywall Systems:

1. Lusterless (Flat) Emulsion Finish: 2 coats.

    - a. Primer: Latex-Based Interior White Primer.
    - b. Finish Coat: Latex-Based Interior Flat Paint.

2. Odorless Semigloss Alkyd Enamel Finish: 3 coats with total dry film thickness not less than 2.5 mils.

    - a. Primer: Interior Latex-Based White Primer.
    - b. First Coat: Interior Semigloss Odorless Alkyd Enamel.
    - c. Second Coat: Interior Semigloss Odorless Alkyd Enamel.

D. Woodwork and Hardboard:

1. Semigloss Enamel Finish: 3 coats.

    - a. Undercoat: Interior Enamel Undercoat.
    - b. First Coat: Interior Semigloss Odorless Alkyd Enamel.

c. Second Coat: Interior Semigloss Odorless Alkyd Enamel.

E. Ferrous Metal:

1. Full-Gloss Enamel Finish: 2 coats over primer with total dry film thickness not less than 2.5 mils.

a. Primer: Synthetic Rust-Inhibiting Primer.
b. Undercoat: Interior Enamel Undercoat.
c. Finish Coat: Exterior Alkyd Gloss Enamel.

F. Zinc-Coated Metal:

1. Full-Gloss Enamel Finish: 2 coats over primer with total dry film thickness not less than 2.5 mils.

a. Primer: Galvanized Metal Primer.
b. Undercoat: Interior Enamel Undercoat.
c. Finish Coat: Exterior Alkyd Gloss Enamel.

3.8 COLOR SCHEDULE:

A. Assume the following exterior colors:

1. Exterior Metals (ferrous and galvanized): Color A.
2. Exterior Gypsum Board Soffits: White Semi-gloss.

B. Assume the following interior colors:

1. Concrete: White Semi-gloss.
2. Metal Fabrications: Color B.
4. Hollow Metal Doors: Color C.
5. Hollow Metal Frames: Color D.
6. Wood Doors and Opaque Trim: White Semi-gloss.
6. Gypsum Wall Board:
    a. Unit Interiors: Flat Off-White.
    b. Unit Interiors, Kitchens and Baths: White Semi-gloss.
    c. Common Areas: Flat, Color E.
7. Piping, Conduit, and Mechanical: Colors C and D.

END OF SECTION 09900

OAK TERRACE
BUILDING FINISH SCHEDULE

TOWER FIRST FLOOR

RM NO	ROOM NAME	FLOOR	BASE	WALLS	CEILING	REMARKS
101	VESTIBULE	QUARRY TILE	QUARRY TILE	GWB	GWB	WAINSCOT
102	VESTIBULE	QUARRY TILE	QUARRY TILE	GWB	GWB	WAINSCOT
103	RETAIL	CONCRETE	VINYL	GWB	ACOUSTIC	
104	RETAIL	CONCRETE	VINYL	GWB	ACOUSTIC	
105	FIRE CONTROL	VCT	VINYL	GWB	ACOUSTIC	1 HR ENCLOSURE
106	TRASH ROOM	CONCRETE	-	PLASTIC PANEL	ACOUSTIC	2 HR ENCLOSURE
107	MAIN LOBBY	QUARRY TILE	QUARRY TILE	GWB	GWB	WAINSCOT
108	MAIL ROOM	VCT	VINYL	GWB	ACOUSTIC	
109	OFFICE	CARPET	VINYL	GWB	ACOUSTIC	
110	OFFICE	CARPET	VINYL	GWB	ACOUSTIC	
111	CORRIDOR	CARPET	VINYL	GWB	ACOUSTIC	
112	OFFICE	CARPET	VINYL	GWB	ACOUSTIC	
113	KITCHENETTE	SHEET VINYL	VINYL	MRGWB	ACOUSTIC	
114	TOILET	CERAMIC TILE	CERAMIC TILE	MRGWB	ACOUSTIC	
115	OFFICE	CARPET	VINYL	GWB	ACOUSTIC	
116	JANITOR	VCT	VINYL	MRGWB	ACOUSTIC	
T1	STAIR	VCT	VINYL	GWB	-	2 HR ENCLOSURE
T2	STAIR	VCT	VINYL	GWB	-	2 HR ENCLOSURE

TOWER BASEMENT

RM NO	ROOM NAME	FLOOR	BASE	WALLS	CEILING	REMARKS
-	CORRIDOR	CARPET	VINYL	GWB	ACOUSTIC	
B1	LAUNDRY	QUARRY TILE	QUARRY TILE	MRGWB	ACOUSTIC	
B2	WATER & SPRINK	CONCRETE	VINYL	GWB/CONCRETE	ACOUSTIC	2 HR ENCLOSURE
B3	EMER ELECTRICAL	CONCRETE	VINYL	GWB/CONCRETE	ACOUSTIC	2 HR ENCLOSURE
B4	MAIN ELECTRICAL	CONCRETE	VINYL	GWB/CONCRETE	ACOUSTIC	2 HR ENCLOSURE
-	SMOKE VESTIBULE	VCT	VINYL	GWB	GWB	2 HR ENCLOSURE
T1	STAIR	VCT	VINYL	GWB	-	2 HR ENCLOSURE
T2	STAIR	VCT	VINYL	GWB	-	2 HR ENCLOSURE

OAK TERRACE
BUILDING FINISH SCHEDULE

LOWRISE PUBLIC SPACES

ROOM NAME	FLOOR	BASE	WALLS	CEILING	REMARKS
STAIR 1	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
STAIR 2	VCT/VINYL	VINYL	GWB	GWB	2 HOUR ENCLOSURE
STAIR 3	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
STAIR 4	VCT/VINYL	VINYL	GWB	GWB	2 HOUR ENCLOSURE
STAIR 5	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
STAIR 6	VCT/VINYL	VINYL	GWB	GWB	2 HOUR ENCLOSURE
STAIR 7	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
STAIR 8	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
STAIR 9	VCT/VINYL	VINYL	GWB	GWB	2 HOUR ENCLOSURE
STAIR 10	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
STAIR 11	VCT/VINYL	VINYL	GWB	GWB	2 HOUR ENCLOSURE
STAIR 12	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
STAIR 13	VCT/VINYL	VINYL	GWB	GWB	2 HOUR ENCLOSURE
STAIR 14	VCT/VINYL	VINYL	GWB	GWB	1 HOUR ENCLOSURE
TRASH ROOM	CONCRETE	-	PLASTIC PANEL	GWB	2 HOUR ENCLOSURE

UNIT FINISHES (TYPICAL FOR ALL UNITS)

ENTRY AREA	CARPET	VINYL	GWB	GWB	
LIVING ROOM	CARPET	VINYL	GWB	GWB	
DINING ROOM	CARPET	VINYL	GWB	GWB	
KITCHEN	SHEET VINYL	VINYL	MRGWB	GWB	
BEDROOMS	CARPET	VINYL	GWB	GWB	
BATHROOM	CERAMIC TILE	CERAMIC TILE	MRGWB	MRGWB	CLG HEIGHT 7'-3"
LAVATORY	SHEET VINYL	VINYL	GWB	GWB	
CORRIDORS	CARPET	VINYL	GWB	GWB	
STAIRS	CARPET	WOOD	GWB	GWB	
LAUNDRY CLOSET	SHEET VINYL	VINYL	GWB	GWB	

OAK TERRACE
BUILDING FINISH SCHEDULE

TOWER TYPICAL FLOOR (SECOND THROUGH TENTH)

RM NO	ROOM NAME	FLOOR	BASE	WALLS	CEILING	REMARKS
	CORRIDOR	CARPET	VINYL	GWB	ACOUSTIC	
	TRASH ROOM	VCT	VINYL	GWB	ACOUSTIC	1 HR ENCLOSURE
	ELECTRIC CLOSET	VCT	VINYL	GWB	ACOUSTIC	1 HR ENCLOSURE
	SMOKE VESTIBULE	VCT	VINYL	GWB	GWB	2 HR ENCLOSURE
T1	STAIR	VCT	VINYL	GWB	GWB	2 HR ENCLOSURE
T2	STAIR	VCT	VINYL	GWB	GWB	2 HR ENCLOSURE

TOWER PENTHOUSE

	ROOM NAME	FLOOR	BASE	WALLS	CEILING	REMARKS
	MECHANICAL ROOM	CONCRETE	VINYL	GWB	GWB	2 HR ENCLOSURE
	ELECTRIC CLOSET	CONCRETE	VINYL	GWB	GWB	2 HR ENCLOSURE
	ELEVATOR MACH	CONCRETE	VINYL	GWB	GWB	2 HR ENCLOSURE
T1	STAIR	VCT	VINYL	GWB	GWB	2 HR ENCLOSURE

SECTION 10200 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Fixed metal wall louvers.
2. Insulated blank-off panels for wall louvers.
3. Wall vents.

B. Work Specified Elsewhere:

1. Air intake louvers integral to HVAC terminal units are specified with units in Section 15600, "Heating, Ventilating, and Air Conditioning".

C. Related Sections: The following sections contain requirements that relate to this section.

1. Section 04200, "Unit Masonry", for anchorage of louvers in masonry openings.
2. Section 07900, "Joint Sealers", for sealants installed in perimeter joints between louver frames and adjoining construction.
3. Section 15600, "Heating, Ventilating, and Air Conditioning", for ductwork connected to wall louvers installed as work of this Section.

1.3 DEFINITIONS:

A. Louver Terminology: Refer to AMCA Publication 501-85 for definitions of terms for metal louvers not otherwise defined in this section or referenced standards.

1.4 SYSTEM PERFORMANCE REQUIREMENTS:

A. Structural Performance: Design, engineer, fabricate, and install exterior metal wall louvers to withstand the effects of loads and stresses from wind and normal thermal movement, without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; and permanent damage to fasteners and anchors:

1. Wind Load: Uniform pressure (velocity pressure) of 20 lbs per sq. ft. acting inwards or outwards for units less than 40 feet above finish grade to centerline of unit.
2. Wind Load: Uniform pressure (velocity pressure) of 31 lbs per sq. ft. acting inwards or outwards for units greater than 40 feet above finish grade to centerline of unit.
3. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss.

   a. Temperature Change (Range): 100 deg F (55.5 deg C).

B. Air Performance, Water Penetration, and Air Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturers stock units, of height and width indicated, according to Air Movement and Control Association (AMCA) Standard 500.

1.5 SUBMITTALS:

A. Product data for each product indicated.

B. Shop drawings of louver units and accessories. Include plans, elevations, sections, and details showing profiles, angles, spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; and profiles of frames at jambs, heads and sills.

1. Include structural computations, material properties, and other information needed for structural analysis which has been prepared by, or under the supervision of, a qualified professional engineer to show installed products comply with structural design loadings.

C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for those units with factory-applied color finishes.

D. Samples for verification purposes of each type of metal finish required, prepared on 6 inch square metal samples of same thickness and alloy indicated for final unit of Work.

E. Product certificates signed by louver manufacturers certifying that their products which comply with Project requirements are licensed to bear AMCA Seal based on tests made in accordance with AMCA Standard 500 and complying with AMCA Certified Ratings Program.

1.6 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain louvers and vents from a single source where alike in one or more respects with regard to type, design, and factory-applied color finish.

B. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated which has resulted in the successful installation of louvers similar in material, design, and extent to that indicated for this Project.

C. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS:

A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. Airline Products Co. Div., Danzer Metal Works Co.
2. Airolite Co.
3. Airstream Products Div., Penn Ventilator Co., Inc.
4. American Warming and Ventilating, Inc.
5. Arrow United Industries.
6. Construction Specialties, Inc.
7. Industrial Louvers, Inc.
8. Reliable Metal Products.
9. Ruskin Mfg. Div., Phillips Industries, Inc.
10. Sunvent Industries, Sylro Sales Corp.

2.2 MATERIALS:

A. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.

C. Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.

1. Use types, gages, and lengths to suit unit installation conditions.
2. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

E. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.3 FABRICATION, GENERAL:

A. General: Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.

B. Preassemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of size indicated with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.

1. For louvers installed in hollow metal frames, fabricate with flanges for installation in 1" glazing channel.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, or if not indicated manufacturer's standard to comply with performance requirements, but not further apart than recommended by manufacturer, or 72 inches o.c., whichever is less. At horizontal joints between louver units provide horizontal mullions.

G. Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

H. Join frame members to one another and to fixed louver blades as follows, unless otherwise indicated, or size of louver assembly makes bolted connections between frame members necessary:

1. With fillet welds, concealed from view; or mechanical fasteners; or a combination of these methods; as standard with louver manufacturer.

2.4 FIXED EXTRUDED ALUMINUM WALL LOUVERS:

A. Horizontal Drainable Fixed Blade Louvers: Extruded aluminum frames and louver blades; designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and of channels in jambs and mullions; complying with the following requirements.

1. Louver Depth: 4 inches, unless otherwise indicated.
2. Frame and Louver Blade Thickness: 0.081 inch, unless otherwise indicated or required to comply with performance requirements.
3. Louver Blade Angle: 37-1/2 degrees, unless otherwise indicated.
4. Performance Requirements: As follows, determined by testing units 48 inches wide by 48 inches high per AMCA Standard 500:
    a. Louver Free Area: Not less than 7.34 sq. ft.
    b. Static Pressure Loss: Not more than 0.15 inch water gage at an airflow of 1000 fpm free area intake velocity.
    c. Water Penetration: Not more than 0.02 oz. per sq. ft. of free area at an airflow of 1450 fpm free area velocity when tested for 15 minutes.
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS:

A. General: Provide each exterior louver with louver screens complying with the following requirements:

1. Screen Location for Fixed Louvers: Interior face, unless otherwise indicated.
2. Screening Type: Bird screening, unless otherwise indicated.

B. Secure screens to louver frames with stainless steel machine screws, spaced at each corner and at 12 inch o.c. between.

1. Bird Screening: 1/4 inch square mesh formed with 0.048 inch diameter aluminum wire.

2.6 INSULATED BLANK-OFF PANELS:

A. General: Fabricate blank-off panels from materials and to sizes indicated and to comply with the following requirements:

1. Finish: Match finish applied to louvers with respect to coating type, color and gloss.
2. Attach blank-off panels to back of louver frames with stainless steel sheet metal screws.
3. Coordinate blank-off panel size and opening with sheet metal ductwork to be attached.

B. Insulated Blank-Off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets; complying with the following requirements:

1. Thickness: 1 inch.
2. Metal Facing Sheets: Aluminum sheet, 0.032 inch thick.
3. Insulating Core: Extruded polystyrene insulation board insulation complying with ASTM C 578, Type VII (2.2 lb/cu. ft. density).
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded aluminum channel frames 0.081 inch thick, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with polyvinyl chloride compression gaskets, 1/8 inch by 1 inch.
6. Furnish with sheet metal flanges for attachment of ductwork.

2.7 WALL VENTS:

A. Extruded Aluminum Wall Vents: Extruded aluminum louvers and frames not less than 0.125 inch thick and assembled by welding; with 18 x 14 mesh aluminum wire insect screening on inside face; incorporating weep holes, vent baffle, continuous drip at sill, and integral water stop on inside edge of sill; of load-bearing design and construction.

2.8 ALUMINUM FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes. Finish louvers after assembly.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Baked Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.5 mils, medium gloss.
2. Color: As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in concrete, masonry, or hollow metal construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION:

A. Locate and place louver units plumb, level, and in proper alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding operations require for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations and refinish entire unit, or provide new units.

F. Protect galvanized and nonferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealers" for sealants applied during installation of louver.

3.3 ADJUSTING AND PROTECTION:

A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.

1. Clean and touch-up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.4 CLEANING:

A. Periodically clean exposed surfaces of louvers and vents, which are not protected by temporary covering, to remove fingerprints and soil during construction period; do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and with a mild soap or detergent not harmful to finishes. Rinse thoroughly and dry surface.

END OF SECTION 10200

SECTION 10425 - SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. ADA Compliance for Signage: Provisions of "ADA Accessibility Guidelines for Buildings and Facilities", Section 4.30, published The Federal Register, 26 July 1991, applies to this Section.

1.2 SUMMARY:

A. This Section includes the following types of signs:

1. Raised copy acrylic panel signs with accompanying braille.
2. Applied vinyl film letters and numbers.
3. Dimensional aluminum letters and numbers.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, accessories, layout, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and layout of lettering.
2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
3. Furnish full-size spacing templates for individually mounted dimensional letters and numbers and applied vinyl film letters and numbers.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:

   a. Cast Acrylic Sheet: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
   b. Aluminum: Samples of each finish type and color, on not less than 4-inch squares of sheet or plate, showing the full range of colors available.

2. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated:

   a. Raised Copy Acrylic Panel Signs: Provide a sample panel not less than 2 inches by 10 inches for each material indicated. On panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.
   b. Applied Vinyl Film Letters and Numbers: Provide full-size representative sample of type required, showing letter style, color, and material.
   c. Dimensional Letters: Provide full-size representative sample of dimensional letter type required, showing letter style, color, and material finish and method of attachment.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of Panel Signs:

  a. ABC Architectural Signing System, Division of Nelson-Harkins Industries.
  b. Allenite, A Division of Allen Marking Products, Inc.
  c. Andco Industries Corp.
  d. APCO Graphics, Inc.
  e. Architectural Graphics, Inc.
  f. ASI Sign Systems, Inc.
  g. Best Manufacturing Co.
  h. Modulex.
  i. Mohawk Sign Systems.
  j. Spanjer Brothers, Inc.
  k. The Supersine Company.
  l. Vomar Products, Inc.

2. Manufacturers of Dimensional Letters:

  a. Andco Industries Corp.
  b. A.R.K. Ramos Manufacturing Company, Inc.
  c. ASI Sign Systems, Inc.
  d. Gemini, Inc.
  e. Metal Arts, Division of L & H Manufacturing Co.
  f. The Southwell Company.
  g. Spanjer Brothers, Inc.
  h. Steel Art Company, Inc.

2.2 MATERIALS:

A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:

1. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.

B. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the aluminum producer and finisher for the casting process used and for the use and finish indicated.

C. Vinyl Film: Provide opaque nonreflective vinyl film, 0.0035 inch minimum thickness, with pressure sensitive backing, suitable for exterior as well as interior applications.

D. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

E. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into masonry work.

F. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

2.3 RAISED COPY ACRYLIC PANEL SIGNS:

A. Panel Signs, General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Panel Width: As follows:

   a. Unit Numbers: 4 inches.
   b. Other Panels: 10 inches; if indicated text will not fit on one line, add additional lines as required.

2. Panel Height: 2 inches for one line of text; and additional 1-5/8 inches for each additional line of text.
3. Edge Condition: Square cut.
4. Corner Condition: Square corners.

C. Raised Copy: Machine-cut copy characters from matte-finish opaque acrylic sheet and chemically weld onto the acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Panel Material: Matte-finished opaque acrylic sheet.
2. Raised Copy Thickness: 1/16 inch.
3. Braille: Grade 2, Embossed, stamped or cast to sign panel.

D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

1. Center text in width of sign panel with identical braille text centered in margin below.
2. Center single line of text in height of sign panel (3/8 inch margin at top and bottom). Where more than one line of text is indicated, provide 3/8 inch margins at top and bottom and center text, including line spacing between. Locate braille text within 3/8 inch margin below each line of text.
3. Panel Color: As selected.
4. Text Color: White.
5. Text Style: Roman font complying with ADA requirements for serifs.
6. Text Height: 1-1/4 inches.
7. Letter Width to Height Ratio: Not less than 3:5 nor more than 1:1.
8. Stroke Width to Letter Height Ratio: Not less than 1:10 nor more than 1:5.

2.4 APPLIED VINYL FILM LETTERS AND NUMBERS:

A. Cutout Letters and Numbers: Cut letters and numbers from solid sheet material of thickness indicated. Produce precisely cut characters with square cut, smooth edges. Comply with requirements indicated for finish, style, and size.

1. Letter Height: 1-1/2 inches.
2. Letter Style: Times Roman.
3. Color: White.

2.5 DIMENSIONAL LETTERS AND NUMBERS:

A. Cast Letters and Numbers: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.

1. Metal: Aluminum.
2. Height: 5 inches.
3. Letter Style: Times Roman.
4. Letter Height: 6 inches, unless otherwise indicated.
5. Letter Height: 4 inches, where indicated.

B. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Class II Clear Anodized Fine Satin Finish: AA-M31C21A31 (Mechanical Finish: Fine satin directional textured; Chemical Finish: Fine matte etched finish; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

   1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Raised Copy Acrylic Panel Signs: Attach signs to wall surfaces using liquid silicone adhesive recommended by the sign manufacturer to attach sign units. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.

   1. Shim Plate Mounting: Provide concealed aluminum shim plates 1/8 inch thick, with predrilled and countersunk holes, at locations indicated and where other mounting methods are not practicable. Attach the plate with fasteners and anchors suitable for secure attachment to the substrate. Attach panel sign units to the plate using the method specified above.
   2. Height: 60" above finish floor.
   3. Location: Mount just to the side of door jamb on latch side. If locating within 18" of door jamb is impractical because of sidelights or other obstructions, mount sign on door face.
   4. Location: Mount Unit numbers centered on door face.

C. Applied Vinyl Film Letters: Attach vinyl characters to door face, centering in surface, using heat/pressure recommended by manufacturer to attach units. Provide templates or other devices to establish character spacing.

   1. Height: 60" above finish floor.

D. Dimensional Letters and Numbers: Mount letters and numbers using standard concealed fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Flush Concealed Mounting: Mount letters by inserting threaded studs into tapped lugs on the back of the plaque. Set in predrilled holes filled with quick-setting cement with backs in contact with the wall surface.

3.2 CLEANING AND PROTECTION:

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.3 SIGNAGE SCHEDULE:

A. General: Supply the following signs, complying with indicated requirements.

B. Cast Acrylic Panel Signs:

1. Unit Entry: For each unit door not entered directly from the street, furnish one sign. The Architect will provide numbering system.
2. Tower First Floor: Provide the following sign panels: "FIRE CONTROL ROOM", "MAIL ROOM", "STAIR", "JANITOR", "OFFICE".
3. Tower Basement: Provide the following sign panels: "SPRINKLER AND FIRE PUMP ROOM", "MAIN ELECTRICAL ROOM", "EMERGENCY ELECTRICAL ROOM", "LAUNDRY", "STORAGE", "STAIR" (at 2 locations).
4. Tower Typical Floor: Provide the following sign panels: "ELECTRICAL CLOSET", "TRASH ROOM", "STAIR" (at 2 locations).
5. Tower Penthouse: Provide the following sign panels: "EMERGENCY ELECTRICAL CLOSET", "MECHANICAL ROOM", "ELEVATOR MACHINE ROOM".

C. Dimensional Letters and Numbers:

1. Tower Main Entry:	"OAK TERRACE" "888 WASHINGTON STREET"
2. Retail Entries:	"886" and "890"
3. Oak Street Entries:	"1", "3", "5", and "7"
4. Pine Street Entries:	"1", "3", "5", and "7"
5. Maple Place Entries:	4 inch high numbers: "1", "3", "5", "7", "9", "11", "13", and "15".

D. Applied Vinyl Film Letters and Numbers:

1. Exterior Signs:	"TRASH ROOM" (2 locations). "STAIR TO ROOF" (3 locations).

END OF SECTION 10425

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets.
3. Mounting brackets.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 15 Section "Fire Protection" for fire hose cabinets and valve cabinets and fire protection systems.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. Samples for selection and verification purposes of each type of metal finish required, prepared on metal samples of same thickness and alloy indicated for final unit of Work.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Obtain fire extinguishers and cabinets from one source from a single manufacturer.

B. UL-Listed Products: Fire extinguishers UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. J.L. Industries.
2. Larsen's Manufacturing Co.
3. Modern Metal Products by Muckle.
4. Potter-Roemer, Inc.
5. Walter Kidde, Division of Kidde, Inc.

2.2 FIRE EXTINGUISHERS:

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated which comply with requirements of governing authorities.

1. Abbreviations indicated below identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

B. Multipurpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10-lb. nominal capacity, in enameled steel container.

2.3 MOUNTING BRACKETS:

A. Provide brackets designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated in plated finish.

1. Provide brackets for extinguishers not located in cabinets and for those located in cabinets, where required by cabinet manufacturer.

2.4 FIRE EXTINGUISHER CABINETS:

A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:

  1. Recessed: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

  1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

    a. Square-Edge Trim with 1/4- to 5/16-inch backbend depth.
    b. Trim Metal: Stainless steel, ASTM A 167, ISS Type 302/304 alloy.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

  1. Stainless Steel: Manufacturer's standard door construction, fabricated from austenitic stainless steel complying with ASTM A 167, for ISS Type 302/304 alloy.
  2. Door Glazing: Clear float glass complying with ASTM C 1036, Type I, Class 1, Quality q3.

    a. Clear glass, Class 1 (transparent).

F. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" applied to door. Provide lettering to comply with requirements indicated for letter style, color, size, spacing, and location or, if not otherwise indicated, as selected by Architect from manufacturer's standard arrangements.

  1. Application Process: Silk screen.

G. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style, and location as selected by Architect.

H. Door Style: Manufacturer's standard design.

  1. Break Glass Panel: Float glass, 1/8-inch thick, with inside latch and lock.

    a. Silk-screen lettering or design as indicated.

I. Door Hardware: Provide manufacturer's standard door-operating hardware for locked cabinet type, trim style, and door material and style indicated. Provide door pull located behind glass and exposed standard cylinder lock. Provide concealed or continuous-type hinge permitting door to open 180 deg.

1. Key all cylinders alike and deliver one key for each cabinet installed to Owner.

2.5 STAINLESS STEEL FIRE EXTINGUISHER CABINET FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

   1. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

B. Remove or blend tool and die marks and stretch lines into finish.

   1. Grind and polish surfaces to produce uniform directional, textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: AISI No. 4 finish.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

   1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
   2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
   3. Where exact location of bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

END OF SECTION 10522

SECTION 10550 - POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following postal specialties:

1. Horizontal mailboxes.
2. Vertical mailboxes.

1.3 SUBMITTALS:

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data consisting of manufacturer's technical data and installation instructions for postal specialty units required.

1. Provide manufacturer's certification that equipment proposed conforms to U.S. Postal Service (USPS) regulations and has been approved by the Postmaster General.

C. Shop drawings showing fabrication and installation of postal specialties. Include plans, elevations, and large-scale details. Show anchorages and accessory items. Provide location template drawings for items supported or anchored to permanent construction.

D. Letter from local postal official having jurisdiction indicating that proposed installation is approved and accepted.

1.4 QUALITY ASSURANCE:

A. Requirements of Regulatory Agencies: Comply with USPS requirements for construction and installation of units served by USPS carriers.

B. Review proposed installation with local postal official having jurisdiction. Review unit locations, labeling and identification, proposed mail room plan, keying requirements, and key keeper locations. Obtain approval of same and include with Submittals.

PART 2 - PRODUCTS

2.1 PRODUCTS:

A. Materials and Manufacturers: To coordinate with other work, the following units have been selected for this project. Other manufacturers and products will be considered if, in the opinion of the Architect, they are substantially equal in appearance and performance to that specified, and can be properly installed in indicated locations:

1. Horizontal Rear Loading Mailboxes: 1 unit Model "6310-43" and 2 units Model "6310-44", Bommer Industries, Inc., ganged together in one frame with 44 total mail boxes.
2. Vertical Mailboxes: "9040" Series, Bommer Industries, Inc., recessed mounting in hollow metal frames.

2.2 METALS AND FINISHES:

A. Aluminum: Alloy and temper best suited for the intended use and finish indicated.

1. Plate and Sheet: ASTM B 209, mill finish, where not exposed.
2. Extruded Bar and Shapes: ASTM B 221.
3. Exposed Finish: Manufacturer's standard matching following BHMA or US finish according to ANSI/BHMA A156.18.

    a. Satin Aluminum, Clear Coated: BHMA No. 627 (US27)

B. Steel: Cold-rolled steel sheet or plate, galvanized where indicated or exposed to outside elements with manufacturer's standard baked-enamel finish in color selected by the Architect.

2.3 HORIZONTAL MAILBOXES:

A. General: Provide horizontal-type mailbox units complying with USPS Publication 17 in size and with features indicated.

B. Rear-Loading Door: Manufacturer's standard unit with solid closure and positive latching mechanism.

C. Mail Compartments and Wall Receptacles: Manufacturer's standard, heavy-metal construction. Equip each compartment to receive tenant's name card. Fabricate concealed components of units of manufacturer's standard sheet aluminum or galvanized steel.

D. Compartment Doors and Trim: Fabricate doors and trim of clear-anodized extruded aluminum to suit type of installation and loading method.

1. Identification: Plastic tabs with heat-stamped numbers, as designated by Architect on each door. For sorting, provide slots and clear plastic openings to receive tenants' name cards.
2. Locking: A five-pin tumbler, cylinder lock capable of at least 1000 key changes, with two keys for each box door. Key each box differently and deliver keys to Owner with record of each corresponding lock and key numbers.

E. Directory: Manufacturer's standard directory unit in size and location as indicated and of same materials and finish as box frames, unless otherwise indicated.

2.4 VERTICAL MAILBOXES:

A. General: Provide vertical-style mailbox units complying with USPS Publication 17 in size and with features indicated.

1. Fabricate concealed components of units of manufacturer's standard sheet aluminum or galvanized steel.
2. Each gang of box units to open by mail carrier's key, tilting forward to receive incoming mail. Tenant's key only operates a single, side-hinged compartment door.

B. Doors and Frames: Manufacturer's standard, heavy-metal construction, ganged and nested units with card holders for tenants' identification behind each box. Construct doors with concealed full-length flush hinges, and slots to receive tenants' names and numbers. Fabricate doors and frames of clear-anodized extruded aluminum.

1. Number Identification: As shown or, if not shown, as selected by Architect from manufacturer's standards.
2. Locking: A five-pin tumbler, cylinder lock capable of at least 1000 key changes, with two keys for each box door. Key each box differently and deliver keys to Owner with record of each corresponding lock and key numbers.
3. Opening machined in frame to accommodate an inside lock furnished by local postmaster.

2.5 KEY KEEPER:

A. Recessed Key Keeper: Provide recessed mounted key keeper matching material and finish of mailboxes prepared for Arrow lock to be installed by the USPS. Provide key keeper manufactured by same manufacturer of mailboxes installed.

1. Locate key keeper where directed by local postmaster.

PART 3 - EXECUTION

3.1 PREPARATION:

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate, installing anchors, and applying postal specialties units.

B. Do not begin installation until obtaining approval for proposed installation from local postal officials having jurisdiction.

3.2 INSTALLATION:

A. Install units to comply with manufacturer's instructions and final drawings.

1. Final acceptance is contingent upon compliance with USPS requirements.

END OF SECTION 10550

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes residential toilet and bath accessory items as indicated.

1.3 SUBMITTALS:

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

C. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

B. Grab Bars: Grab bar units shall be installed and anchored as required to resist a 250 lb. concentrated load, applied in any direction, for five minutes without permanent deflection or damage to grab bar or substrate.

1.5 PROJECT CONDITIONS:

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation and operation of toilet accessory items.

1. Coordinate installation of blocking for wall hung items.

B. Fire Rated Assemblies: Where a recessed unit is indicated for installation at a fire-rated gypsum board assembly, coordinate with work of other sections to ensure that proper fire rating is maintained behind installation.

1. Where provision for maintaining fire rating is not feasible, advise Architect and substitute surface mounted unit.

1.6 WARRANTY:

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

B. Warranty Period: 10 years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:

1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Basco, Inc.
4. Bobrick Washroom Equipment, Inc.
5. General Accessory Manufacturing Co.
6. Miami-Carey.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.

B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.

C. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

D. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

E. Mirror Glass: Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 MULTIPURPOSE UNITS:

A. Multipurpose Units: Provide combination unit fabricated of stainless steel with seamless 1-inch-wide wall flange, mirrored door with tumbler lock and continuous piano hinge, paper towel dispenser, 80-ounce minimum capacity soap dispenser with sight gauge and tumbler lock for servicing, shelf above soap dispenser, and the following features.

1. Soap Valve for dispensing soap in liquid form.
2. Towel Dispenser: Capacity for 400 C-fold towels or 700 multifold towels, designed to dispense either type without special adapters.
3. Mounting: Semi-recess mounted in nominal 3-inch wall depth.

B. Application: At non-residential toilet rooms.

2.4 GRAB BARS:

A. Stainless Steel Type: Provide grab bars with wall thickness not less than 0.05 inch (18 gage) and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
3. Gripping Surfaces: Manufacturer's standard nonslip texture.
4. Medium-Duty Size: Outside diameter of 1-1/4 inches.

2.5 RESIDENTIAL BATH ACCESSORIES:

A. Single-Roll Toilet Tissue Dispenser: Size to accommodate core type tissue to 5-inch-diameter roll.

B. Shower Curtain Rod, Normal Duty: 1-inch o.d., 0.04-inch (20-gage) stainless steel, satin finish; furnish with 3-inch o.d., minimum 0.04-inch (20-gage) stainless steel flanges with satin finish, designed for concealed fasteners.

C. Soap Dish: Satin-finished, stainless steel soap dish with rectangular wall bracket equipped with backplate for concealed mounting.

D. Towel Bar: 24-inch-long, satin-finished, Type 304 stainless steel tubular (3/4-inch-square) bar and rectangular end brackets. Provide galvanized backplates for concealed mounting.

E. Double-Prong Robe Hook: Heavy-duty satin finished stainless steel double-prong robe hook; rectangular wall bracket with backplate for concealed mounting.

F. Tumbler and Toothbrush Holder: Satin-finished stainless steel unit with 2-1/4-inch-diameter hole in center to hold tumbler and two holes on each side to accommodate total of four toothbrushes; rectangular wall bracket equipped with backplate for concealed mounting.

G. Standard Medicine Cabinet: Unit designed for semi-recessed mounting in nominal 3-inch wall depth consisting of hinged stainless steel framed mirror door concealing storage cabinet with minimum four adjustable glass shelves. Door equipped with full-length, piano hinge and spring-buffered, rod-type stop and magnetic door catch. Fabricate door, hinge and cabinet of enamel-finish steel, as specified under "Materials, General". Furnish in nominal 16-by-36-inch mirror size.

   1. Acceptable Product: Model "377P", Basco.

H. Barrier-Free Medicine Cabinet: Unit designed for semi-recessed mounting in nominal 3-inch wall depth consisting of hinged stainless steel framed tilting mirror door concealing storage cabinet with minimum three adjustable glass shelves. Door equipped with full-length, piano hinge and spring-buffered, rod-type stop, magnetic door catch, and with a latch to keep door closed when mirror is tilted into down position. Fabricate door, hinge, cabinet and shelves of enamel-finish steel, as specified under "Materials, General". Furnish in nominal 16-by-26-inch mirror size.

   1. Acceptable Product: Model "375-ATM", Basco.

I. Frameless Mirror Units: Fabricate of mirror glass as specified under "Materials, General", with polished pencil edges. Furnish acrylic mounting clips and stainless steel fasteners.

2.6 FABRICATION:

A. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation.

F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Inspect wall surfaces receiving grab bars with Installer present to ensure that blocking is properly located and installed.

3.2 INSTALLATION:

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in tamperproof manner with acrylic mounting clips. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Install grab bars to withstand a concentrated load of at least 250 lbs, complying with ASTM F 446.

3.3 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 10916 - CLOSET SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. This Section includes closet shelving with integral hanging rod systems.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's product data and installation instructions.

C. Shop Drawings: Submit plans and details for typical and non-typical closet arrangements, showing proposed layout arrangement, support points, and all proposed accessories.

1.4 WARRANTY:

A. Warranty: Provide product with manufacturer's standard warranty, agreeing to replace or repair defective materials and workmanship for a period of ten years. This warranty shall be in addition to and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Schulte Corp., Cincinnati, OH.
2. Closet-Maid Corp., a Division of Lee-Rowan.

2.2 MATERIALS AND FABRICATION:

A. General: Provide manufacturer's standard shelving system with components and accessories as required for a complete installation.

1. Steel Wire: Cold drawn phosphated steel rod, 100,000 psi tensile strength.
2. Metal Coating: Manufacturer's standard electrostatically applied epoxy or vinylized-epoxy coating.

   a. Color: White.

3. Accessories: As required for a complete system, including the following:

   a. Support braces: steel, sized to match shelf width.
   b. End brackets: plastic.
   c. Back clips: plastic, with lock flap to prevent lifting.
   d. Corner brackets: steel.
   e. Screws and wall anchors of appropriate size and type for securing to substrate.
   f. Sidewall support: plastic, for installation at non-rectangular sidewalls.

B. Sizes: All shelf units shall be the full width of the indicated location.

1. For shelf and rod units, manufacturer's standard 12 inches deep shelf with suspended hanging rod.
2. For linen shelf units, depth as indicated on drawing, or if not indicated, manufacturer's largest standard depth unit that will fit in location shown, up to 16 inches.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Set each component of work securely and accurately in place in accordance with final approved shop drawings; plumb, level and properly aligned with other components and other work. Anchor as required for secure and permanent attachment.

1. Do not use nails to anchor units or accessories.

B. Install end brackets at each shelf where the front edge of the unit abuts a side wall.

1. At locations where end brackets cannot be installed because of closet configuration, terminate shelf unit with a support bracket and install end caps on exposed cut ends.

2. At locations where shelf unit adjoins another shelf unit in a 90 degree corner, install manufacturer's standard corner bracket support.
3. At locations where shelf unit abuts a non-rectangular sidewall, cut unit to profile required and install in sidewall support, with end bracket as required.

C. Back clips: Install back clips at not more than 8" o.c.

D. Support Brackets: Install support brackets at center span of all units exceeding 42", but not greater than 84", in length. On units longer than 84", install support brackets at 42" o.c.

E. Install additional accessories as indicated or recommended by manufacturer for complete system.

3.2 PERFORMANCE REQUIREMENT:

A. Install each unit to support 75 lbs. per linear foot of shelving at the front edge of the unit for a period of five minutes without failure or permanent damage to system or substrate.

END OF SECTION 10916

SECTION 11170 - SOLID WASTE HANDLING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. This Section includes the following solid waste handling equipment:

1. Packaged chute-fed waste compactor unit.
2. Packaged hopper-fed waste compactor unit.
3. Intake door for hopper-fed unit.
3. Rolling waste containers.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Trash chutes, including intake doors, are specified in Section 14560, "Chutes".
2. Electrical service to compactor, including fused disconnect switch, is included in a Division 16 Section.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's product specifications, performance data sheets, and installation instructions for each principal component of waste handling equipment, and include certified test reports on operation of units.

C. Shop Drawings: Submit plans, elevations and details for work not fully shown by published product data; include rough-in dimensions and service connection locations and details.

D. Maintenance Manuals: Submit bound maintenance manuals for each major operational unit of equipment. Including operating and maintenance instructions, parts listing, parts inventory listing, purchase source listing for operational/maintenance materials, emergency instructions and similar information.

1.4 QUALITY ASSURANCE:

A. Regulatory Requirements: Comply with Federal, State and Local regulations and with the following standards:

1. Waste Compactor Standards: ANSI Z 245.1, "Safety Requirements for Refuse Collection and Compaction Equipment".

2. Waste Bin and Hopper Standards: ANSI Z 245.3, "Safety Requirements for the Stability of Refuse Bins".

B. Electrical Component Standards: Provide components complying with NFPA 70 "National Electrical Code"; and bearing UL labels where available.

1.5 WARRANTY:

A. Waste Compactor Project Warranty: Provide project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of trash compactor work during warranty period. This warranty shall be in addition to and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performance below minimum requirements, unusual deterioration or aging of materials, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.

2. Warranty period, beginning on date of substantial completion, is 36 months.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Materials and Manufacturers: For the purpose of establishing a standard of quality, functionality, and performance, a single manufacturer's system has been specified. Other products/systems will be accepted if, in the opinion of the Architect, they are substantially equal in performance, quality, and functionality of that specified.

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. Packaged Chute-fed Waste Compactor: International Dynetics Corp. Model "520A".
2. Packaged Hopper-fed Waste Compactor: International Dynetics Corp. Model "520SS".

2.2 MATERIALS AND COMPONENTS:

A. General: Provide manufacturer's standard packaged, pre-engineered or prefabricated units except as otherwise indicated, with selections as indicated to comply with requirements; and with components of each unit complying with manufacturer's published product literature, and as required for a complete system.

B. Electrical Work: Provide manufacturer's standard materials, devices and controls of type and quality recommended by NEMA for applications indicated. Refer to Division-16 sections for power characteristics and service to equipment units, including disconnect switches.

C. Materials:

1. Zinc-Coated Steel Sheet: ASTM A 526 except where another type is required for forming, heat resistance or other exposures; ASTM A 525 G90 zinc coating, with chemical treatment except mill phosphatized where indicated for painting or coating.

2. Metal Coating: Manufacturer's standard baked synthetic enamel primer and finish coats, selected for resistance to damage or deterioration from exposure conditions.

3. Casters: Caster manufacturer's heavy-duty steel casters with ball-bearing swivels and either phenolic resin or rubber tired wheels; of grade and size recommended by manufacturer for maximum possible weight supported, but not less than 4" diameter.

D. Intake Door/Frame Unit: Provide self-closing side-hinged unit at exterior trash room as indicated. Use manufacturer's recommended mounting height for door. Equip door with positive latch and Tee handle with locking cylinder and key. Provide manufacturer's standard stainless steel door and frame unit, AISI Type 302/304 with standard satin finish or No. 3 directional polish. Frame shall have exterior lipped flange for mounting in brick veneer construction. All parts and operating hardware shall be non-ferrous.

1. Door Size: 18" by 18".
2. Equip door/frame unit with integral through-wall stainless steel sleeve.

2.3 WASTE COMPACTOR AND CONTAINERS:

A. General: Manufacturer's standard heavy-duty steel stationary compactor with fully-automatic operation, including motor, controls, accessories and equipment for normal operation.

  1. Provide remote wall mounted controls.

B. Operation: Hydraulic ram fed unit, with automatic shut-off and signal when full or when an oversize or uncrushable object is encountered.

  1. Provide side door in hopper for manual feeding into compactor, equipped with shut-off switch to prevent compactor from operating when door is open.

  2. Provide manufacturer's standard motor overload and hydraulic overheat protection.

  3. Provide photo-electric signal operation.

C. Container Interlock: Compactor shall be equipped with lock device to prevent operation when container is not properly engaged and secured to compactor.

D. Waste Containers: Manufacturer's standard heavy-duty steel two cubic-yard rolling container, front or rear loading as applicable for indicated application, compatible with specified compactor.

  1. Provide two (2) two-yard containers for chute-fed compactor unit and one two-yard container for hopper-fed compactor unit..

E. Finish: Manufacturer's standard heavy-duty primer and enamel finish paint.

2.4 FABRICATION AND COMPONENTS:

A. Fabricate metalwork with manufacturer's standard joints and seams, with exposed edges smoothed and eased. Except as otherwise indicated, fabricate bins, hoppers, compaction chambers, unit bodies and similar components of steel plate with welded joints. Reinforce with structural steel members sized and spaced to withstand impacts and pressures of normal operations, and sufficient to prevent excessive long-term development of waves or valleys. Fabricate with replaceable parts at points of normal wear.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Set each component of work securely and accurately in place; plumb, level and properly aligned with other components and other work. Anchor as required for secure operation.

B. Complete field assembly with joints as recommended by manufacturer. Grind welds smooth and restore finish.

  1. Comply with NECA Standards for electrical work.

C. Protection: Take proper precautions to ensure that all installations are protected from damage by other trades or construction activities.

  1. Install protective cover seal over compactor hopper to prevent use until date of Substantial Completion or other acceptance by Owner. Protective seal shall be removed in the presence of the Owner's representative.

3.2 TESTING AND INSTRUCTIONS:

A. Test each item of operational equipment including safety devices and fire protection equipment.

B. Instruct Owner's operational personnel in proper use and maintenance of equipment, and demonstrate capacity ratings, safety features, cleaning procedures, and proper storage/handling of raw and processed waste materials.

END OF SECTION 11170

SECTION 11450 - RESIDENTIAL KITCHEN APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of residential equipment required is indicated on drawings.

B. This Section includes the following residential equipment:

1. Gas ranges.
2. Gas cooktops.
3. Range Hoods.
4. Gas wall ovens.
5. Refrigerator/freezers.
6. Food waste disposers.
7. Dishwashers.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Plumbing connections are specified in Section 15400, "Plumbing".
2. Electrical services and connections are specified in Section 16000, "Electrical".

1.3 QUALITY ASSURANCE:

A. Certification Labels: Provide residential equipment which complies with standards and bears certification labels as follows:

1. Energy Ratings: Provide energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by Federal Trade Commission.
2. UL Standards: Provide residential equipment with UL labels.
3. ANSI Standards: Provide gas burning residential equipment with American Gas Assoc. (AGA) seal of approval, complying with ANSI Z21-Series.

B. Uniformity: Provide products of same manufacturer for each type of residential equipment required.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of residential equipment, including data indicating compliance with requirements. Submit operating and maintenance instructions for each item of residential equipment.

B. Schedule: Submit schedule of residential equipment, using same room designations shown on drawings.

1.5 DELIVERY AND STORAGE:

A. Deliver products to project site in manufacturer's undamaged protective containers, after spaces to receive them have been fully enclosed.

1.6 SPECIFIED PRODUCT WARRANTIES:

A. Submit manufacturer's standard written warranty for each item of residential equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Amana Refrigeration Inc.
2. Broan Mfg. Co.
3. Chambers Corp.
4. Frigidaire; White Consolidated Ind.
5. General Electric.
6. Hotpoint.
7. In-Sink-Erator Div.; Emerson Electric.
8. Kitchen Aid Div.; Hobart
9. Modern Maid; Raytheon Co,
10. Sears, Roebuck & Co.
11. Whirlpool Home Appliances.
12. White-Westinghouse

2.2 MATERIALS AND FABRICATION:

A. Colors: Provide manufacturer's standard white or almond color, as selected by Architect. Wherever residential equipment by more than one manufacturer is installed in same space, provide units with color matching largest equipment item, unless otherwise indicated.

2.3 APPLIANCES:

A. General: At barrier-free units, install appliances complying with Massachusetts Barriers Board requirements and as indicated.

1. Controls: Locate switches for vent hood unit remotely as required to be accessible to a person in a wheelchair.

B. Gas Ranges: 30" Freestanding Type: Unit with porcelain enamel, hinged or lift-off recessed cooktop with built-in spillover bowls; 4 - 9000 BTUh burners with removable porcelainized steel grates; pilotless ignition system; self-cleaning oven equipped with manually switched light, black glass oven door with window and safety locking feature, 2 adjustable chrome racks, and porcelain enamel broiler/roaster pan with chrome grille insert; control panel with clock and timer; adjustable legs.

C. Gas Cooktops: Countertop Type: Built-in unit with lift-up, self-edged top surface and porcelain enamel finish; pilotless ignition system; four 9000 BTUh burners with removable porcelainized steel grates; burner controls located on front center of cooktop surface.

D. Range Hoods: Recirculating Type: 30" hood for mounting below wall cabinets, with one- or two-speed fan, permanent washable grease filter and replaceable charcoal odor filter, built-in lighting, baked-on enamel finish.

E. Gas Wall Ovens: Oven/Broiler: Built-in unit with continuous cleaning oven and lower broiling compartment, for installation in 27 inch wide cabinet; control panel with clock, timer, and automatic oven controls; pilotless ignition system; oven equipped with light, adjustable chrome racks, black glass door with window; including porcelain enamel broiler pan with chrome grille insert.

F. Refrigerator/Freezers: Top Freezer Type: Freestanding, two-door unit; both compartments frostless, with separate temperature controls, switch for condensation control heating element at freezer opening; storage features including adjustable shelves, meat compartment, vegetable crisper(s), butter conditioning compartment, removable egg trays or bins, door shelves, and not less than 2 ice cube trays; reversible doors; adjustable rollers.

1. Large Apartment Refrigerator: For three and four bedroom residential apartments:

    a. Capacity: Minimum values, measured according to ANSI B 38.1 and certified by AHAM:

        1) Total volume: 20.6 cubic feet.
        2) Refrigerator volume: 14.30 cubic feet.
        3) Total shelf area: 26.1 square feet.

    b. Energy Consumption: Measured and certified as not more than 80 kWh/month under average conditions.

2. Small Apartment Refrigerator: For one and two bedroom residential apartments.

    a. Capacity: Minimum values, measured according to ANSI B 38.1 and certified by AHAM:

        1) Total volume: 15.5 cubic feet.
        2) Refrigerator volume: 10.75 cubic feet.
        3) Total shelf area: 18.0 square feet.

    b. Energy Consumption: Measured and certified as not more than 80 kWh/month under average conditions.

G. Food Waste Disposers: Continuous Feed Type: 1/2 horsepower motor, 1725 rpm, overload protection, wall-switch operated, corrosion-resistant construction, with quick-mounting feature, stainless steel sink flange, cushioned suspension, and stainless steel grinding chamber; jam-resistant cutting-shredding mechanism featuring swivel-mounted impellers on turntable, cast tool steel grinding ring, and cutlery steel undercutter blade; insulated housing for grinding chamber; anti-splash guard and combination cover/stopper.

1. Electrical connection: Provide units with plug for operation from standard receptacle.

H. Dishwashers: Built-in Type: Undercounter automatic unit sized to replace 24" base cabinet; porcelain enamel interior and sound-absorbing exterior insulation; full-extension upper and lower racks and removable silverware basket; not less than two wash cycles with not less than two wash levels and food pulverizer; energy saving drying cycle; operable at water pressures from 20 to 120 psi and requiring not more than 12.0 gallons of water for normal wash cycle.

1. Finish: Provide manufacturer's standard, white or almond color finish for door front and lower access panel.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's instructions and recommendations.

B. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops and concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate for proper operation of equipment.

D. Utilities: Refer to Division 15 and 16 for plumbing and electrical requirements.

3.2 ADJUST AND CLEAN:

A. Testing: Test each item or residential equipment to verify proper operation. Make necessary adjustments.

B. Accessories: Verify that accessory items required have been furnished.

C. Cleaning: Remove packing material from residential equipment items and leave units in clean condition, ready for operation.

END OF SECTION 11450

SECTION 12372 - KITCHEN AND BATH CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes plastic laminate finished kitchen and bath cabinets and countertops.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 11450, "Residential Equipment", for appliances mounted in kitchen casework.
2. Section 15400, "Plumbing", for sink units mounted in countertops.

1.3 DEFINITIONS:

A. Exposed Surfaces: Surfaces visible when drawers and doors are closed; bottoms of casework 43 inches or more above finished floor.

B. Semi-exposed Surfaces: Surfaces which become visible when doors are open or drawers are extended; bottoms of casework are more than 30 inches and less than 42 inches above finished floor.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each casework type specified.

C. Product data for each hardware type specified.

D. Shop drawings for casework showing location and size, accessories, materials, finishes, and filler panels. Include fully dimensioned plans, elevations, and anchorage details to countertop and walls.

E. Shop drawings for countertops showing sizes, shapes, edge and backsplash profiles, cutouts for plumbing fixtures, and methods of joining.

F. Samples for selection and verification purposes of the following, including operating hardware and typical accessories:

   1. One base cabinet and one wall for each type of unit specified.
   2. Manufacturer's color charts consisting of sections of units showing full range of colors, textures, and patterns available for each type of plastic laminate indicated.

G. If accepted, sample cabinets will be retained by the Architect until cabinetry is delivered to the project. If sample cabinets remain in new condition, they may then be incorporated in the work.

H. Product certificates signed by the manufacturer certifying that materials furnished comply with specified requirements.

I. Maintenance data for kitchen casework for inclusion in Maintenance Manual specified in Division 1.

1.5 QUALITY ASSURANCE:

A. MHFA Accpetance: Provide kitchen and bath casework identical to units approved for installation on MHFA projects. Comply with the following:

   1. Laminate Finish: High pressure plastic laminate only; low pressure laminates and vinyl films do not comply.

B. Kitchen and Bath Casework: Comply with ANSI/NKCA A161.1 and HUD "Minimum Property Standards," Housing 4910.1, paragraph 611-1.1.

   1. NKCA Certification: Provide kitchen casework with National Kitchen Cabinet Association (NKCA) "Certified Cabinet" seal affixed in a semi-exposed location of each unit, evidencing compliance with above standard.

C. Single-Source Responsibility: Obtain casework from one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver casework as a factory-assembled unit, packaged individually, and shipped each in its own carton.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Comply with casework manufacturer's recommendations for optimum temperature and humidity conditions during storage and installation. Do not install casework until these conditions have been attained and stabilized.

B. Field Measurements: Verify casework dimensions by field measurements. Verify kitchen casework can be installed in compliance with the original design and referenced standards. Verify countertop size and shape prior to fabrication by field measurements taken after base units are installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Kitchen and Bath Casework:

   a. Imperial Cabinet Co., Inc.
   b. Merillat Industries, Inc.
   c. Triangle Pacific Corp.
   d. Yorktowne Cabinets

2. Plastic Laminate for Countertops:

   a. Formica Corp.
   b. Laminart
   c. Nevamar Corp.
   d. Sterling Engineered Products, Inc., Pionite
   e. Westinghouse Electric Corp., Micarta Div.
   f. Wilson Plastics Co., Dart Industries, Inc.

2.2 MATERIALS, GENERAL:

A. Sizes, dimensions, and thicknesses given are minimum dimensions.

B. Particleboard: ANSI A208.1, mat-formed particleboard, Grade 1-M-2 with minimum density of 40 pcf, internal bond of 60 psi, and minimum screw-holding capacity of 225 lbs. on faces and 200 lbs. on edges.

C. Hardwood Plywood: ANSI/HPMA HP hardwood and decorative plywood, Good Grade (1) or better, of thickness, species, and cut.

D. Solid Wood: Clear, dry, sound, and free of defects selected from First Grade lumber as defined by NHLA.

E. Plastic Laminate: NEMA LD 3; in thicknesses indicated and colors or patterns, and finishes as selected from approved samples.

2.3 PLASTIC LAMINATE CASEWORK:

A. Face Style: Reveal overlay.

B. Door Style:

1. Kitchen Door/Drawer: Flush plastic laminate with 6 inch stainless steel wire pulls.
2. Bath: Flush plastic laminate with 4 inch white nylon-clad wire pulls.

C. Face Frame: Plastic laminate finish, 3/4 inch by 1-5/8 inch solid wood frame rails and stiles with glued mortise and tenon joints.

D. Concealed Surfaces: Sound and dry solid wood, plywood, or particleboard without defects affecting strength, utility, or stability.

E. Sides, Dividers, Tops, Bottoms, Shelves, and Stretchers: Plastic laminate GP 28 on 1/2 inch thick particleboard. Provide stretchers for top of base cabinet.

F. Back Panels: 1/8 inch thick hardboard with plastic laminate GP 28 on interior surfaces fastened to rear edge of end panels and to top and bottom rails.

G. Exposed Edge Treatment: Edge doors and drawer fronts with plastic laminate of same material as exposed faces.

H. Semi-exposed Edge Treatment: Edge top of drawer body with high-impact plastic tee edging. Edge remaining casework surfaces with plastic laminate GP 28 matching adjoining plastic laminate in color, pattern, and finish.

I. Doors, Drawer Fronts, Fixed Panels, Toeboards, and Ends: Plastic laminate GP 28 on 5/8 inch thick particleboard.

J. Drawers: Fabricate with front, bottom, and back rabbeted in sides and secured with glue and mechanical fasteners as follows:

1. Subfronts, Sides, and Backs: 7/16 inch thick particleboard.
2. Bottoms: 1/4 inch thick particleboard, or 1/8 inch

tempered hardboard or plywood, set into rabbets in back, sides, and front.

3. Drawer Suspension: Provide for a minimum capacity of 50 lbs., with twin track, side-mounted steel drawer-glide suspension with nylon rollers. Provide self-closing feature and manual positive stop.

K. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.

L. Toe Board: 5/8 inch thick particleboard, attached to subbase with concealed fasteners.

M. Hanging Strip: Minimum 3/4 inch by 1 1/2 inch solid wood, top and bottom of wall cabinets and top of base cabinets.

N. Colors:

1. Kitchen: White or Almond, as selected by Architect.
2. Bath: White.

2.4 CASEWORK HARDWARE AND ACCESSORIES:

A. Hardware: Manufacturer's standard units complying with ANSI A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.

1. Hinges: Manufacturer's standard adjusting hinges.

B. Sealant: One-part mildew-resisting silicone sealant, Type S; Grade NS; formulated with fungicide, intended for sealing interior joints subject to exposures of high humidity and moisture.

1. Acceptable Products:

a. "Dow Corning 786"; Dow Corning Corp.
b. "SCS 1702"; General Electric Co.
c. "863 #345 White"; Pecora Corp.
d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.

2.5 COUNTERTOPS, PLASTIC LAMINATE:

A. General: Comply with ANSI A161.2.

B. Countertop, Backsplash, and Endsplash Fabrication: Plastic laminate GP 50 on 3/4-inch particleboard.

C. Configuration: Provide countertops with the following front style, cove, and backsplash/endsplash style:

1. Front Style: Self-edge.
2. Cove: Direct bond.
3. Backsplash and Endsplash Style: Square edge without scribe.

D. Colors: Assume four plastic laminate countertop colors/patterns for this project.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install casework with no variations in flushness of adjoining surfaces, using concealed shims. Where casework abuts other finished work, scribe, and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.

B. Install casework without distortion so that doors and drawers fit openings properly and are aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessories as indicated.

C. Install casework and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.

D. Fasten unit of casework to adjacent unit and into structural support members of wall construction with #10 sheet metal or wood screws with washer head or washer.

E. Fasten plastic laminate countertops by screwing through corner blocks in base units into underside of countertop. Spline and glue joints in countertops and provide concealed mechanical clamping of joint.

F. Seal joints between cabinets and countertops and abutting work with indicated joint sealant.

3.2 ADJUSTING AND CLEANING:

A. Adjust hardware to center doors and drawers in openings and lubricate to provide unencumbered operation.

B. Clean casework on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 12372

SECTION 12500 - WINDOW TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY:

A. This Section includes basic window treatment as follows:

   1. Horizontal blinds.

B. Alternates: The work of this Section is referenced in an Alternate. See Section 01030, "Alternates".

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data and installation instructions for each type of window treatment unit required. Include methods of installation for each kind of opening and supporting structure.

C. Samples for selection and verification of colors, in form of manufacturers' color charts consisting of sections of exposed components with integral or applied finishes showing full range of colors and materials.

   1. In addition, submit one complete small operating unit for each type of window treatment required.

1.4 QUALITY ASSURANCE:

A. General: Provide units produced by one manufacturer for each type required, with complete standard assemblies including hardware accessory items, mounting brackets, and fastenings.

PART 2 - PRODUCTS

2.1 HORIZONTAL BLINDS:

A. Headrail: Channel-shaped section complete with tilting mechanism, top and end braces, top cradles, cord lock, and accessory items required for type of blind and installation.

B. Bottom Rail: Tubular steel bottom rail, designed to withstand twisting or sagging. Contour top surface to match slat curvature, with flat or slightly curved bottom. Close ends with metal or plastic end caps of same color as rail. Finish rail in same color as slats.

C. Slats: Spring-tempered aluminum (louver blades), rounded corners with forming burrs removed, width of 1 inch nominal, other components sized to suit.

D. Ladders: Designed to support and maintain slats at proper spacing and alignment in open and closed positions. Braided polyester cord design consisting of vertical components of not less than 0.043-inch nor more than 0.068-inch in diameter and integrally braided ladder rungs of not less than 4 threads; space ladders not further than 23 inches apart and 7 inches from ends of slats.

E. Tilting Mechanism: Assembly including disengaging worm and gear mechanism to eliminate overdrive, low-friction gear tilter, drum and cradle at each ladder, tilt rod, tape clips, and grommet guides to prevent wear on ladder and cords; designed to hold slats at any angle and prevent movement of slats due to vibration, operated as follows:

    1. Wand Operator: Detachable clear plastic wand, of proper length to suit blind installation, detachable without tools by raising locking sleeve.

F. Lifting Mechanism: Crashproof cord locks with cord separators and braided polyester or nylon lift cords with tassels at ends. Size cord to suit blind type. Include self-aligning cord equalizers designed to maintain horizontal blind position.

G. Installation Brackets: Designed to facilitate removal of head channels. Provide intermediate brackets at spacing recommended by blind manufacturer. Include hardware necessary for secure attachment of brackets to adjoining construction and to headrails. Design brackets to support safely the weight of blind assemblies plus forces applied to operate blinds.

H. Finish: Provide finishes indicated below. Finish exposed accessories and hardware to match rail color. Provide corrosion- resistant finish to concealed items of hardware.

    1. Steel Components: Galvanize and either phosphate coat or prime exposed steel surfaces. Finish with baked-on synthetic resin enamel finish.

2. Aluminum Slats: Chemical conversion coat then follow with baked-on synthetic resin enamel finish coat.

I. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Carey-McFall Corp.
2. Eastern Standard.
3. Graber Industries, Inc.
4. Hunter Douglas, Inc.
5. Kirsch Div., Cooper Industries.
6. Architectural Products Div., Levelor Lorentzen, Inc.

2.2 FABRICATION AND OPERATION:

A. Prior to fabrication, verify actual opening dimensions by accurate site measurements. Adjust dimensions for proper fit at openings.

B. Coordinate with other trades for securing units to substrates and other finished surfaces.

C. Fabricate window treatment components from noncorrosive, nonstaining, nonfading materials that are completely compatible and do not require lubrication during normal expected life.

D. Fabricate blind units to openings fill openings from head to sill and jamb to jamb.

E. Space slats to provide overlap for light exclusion when fully closed.

F. Equip horizontal blind units for the following operation:

1. Full-tilting operation with slats rotating approximately 180 deg. Place tilt operating controls on left-hand side of blind units unless otherwise indicated.
2. Full-height raising, to minimum stacking dimension, with lifting cord locks for stopping blind at any point of ascending or descending travel. Place pull cords on right-hand side of blind units unless otherwise indicated.

PART 3 - EXECUTION

3.1 APPLICATION:

A. Install horizontal blinds at all windows and glazed doors within units and within spaces at tower first floor except retail space along Washington Street.

3.2 INSTALLATION:

A. General: Install window treatment units to comply with manufacturer's instructions. Position units level, plumb, secure, and at proper height and location relative to adjoining window units and other related work. Securely anchor units with clips, brackets, and anchorages suited to type of substrate.

B. Provide clearance between sash and blinds to permit unencumbered operation of sash hardware.

C. Protect installed units to ensure their being in operating condition, without damage, blemishes, or indication of use at substantial completion of project. Correct nonconforming damaged units. Replace units that cannot be field corrected.

END OF SECTION 12500

SECTION 14210 - ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following electric traction elevators:

1. Passenger elevators.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Setting of sleeves, inserts, and anchoring devices in concrete are specified Section 03300, "Cast-in-Place Concrete".
2. Structural framing of hoistways, elevator rail supports, machine beams, and other structural framing is specified in Section 05120, "Structural Steel".
3. Subsills of hoistway entrances and elevator pit ladders are specified in Section 05500, "Metal Fabrications."
4. Elevator shaft enclosures are specified in Section 09250, "Gypsum Drywall".
5. Ventilation of hoistway is specified in Section 10200, "Louvers".
6. Electrical service to each elevator, including fused disconnect switch and emrgency/standby power service, is specified in Section 16100, "Electrical".
7. Heat, smoke, or products of combustion sensing devices are specified in Section 16100, "Electrical".

1.3 DEFINITIONS:

A. Electric traction elevators are hereby defined to include elevators in which cars are hoisted by ropes over power-driven traction sheaves, complete with components, equipment, machines, controls, and devices as indicated and as required for safely operating elevators at rated speed and capacity.

1.4 SYSTEM PERFORMANCE REQUIREMENTS:

A. Elevator schedules indicate required performances, controls, capacities, features, and finishes for each group of elevators and are included at end of this Section.

1.5 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data for each elevator unit, indicating capacities, sizes, performances, operations, safety features, controls, finishes, and similar information. Indicate any variations from specified requirements.

C. Shop Drawings including dimensioned drawings for each elevator, showing plans, elevations, sections and large-scale details indicating service at each landing, coordination with building structure and relationships with other construction. Indicate any variations from specified requirements plus maximum dynamic and static loads imposed on building structure at points of support. Indicate access and ventilation for elevator machinery rooms and hoistways, and locations and details of items furnished under this Section for installation in the work of other sections.

D. Wiring diagrams detailing locations and wiring for power, signal and control systems and differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands.

E. Samples of exposed finishes for car, hoistway doors, and signal equipment, 8-inch to 10-inch square samples of sheet materials, and 10-inch to 12-inch lengths of running trim members.

F. Maintenance Manuals: Bound manuals for each different type electric traction elevator. Include operating and maintenance instructions, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information.

1.6 QUALITY ASSURANCE:

A. Installer Qualifications: Engage the elevator manufacturer or an installer approved by the elevator manufacturer and who has completed elevator installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance.

B. Regulatory Requirements:

1. Comply with ASME/ANSI A17.1, "Safety Code for Elevators and Escalators," hereafter referred to as the "Code."
2. Comply with Massachusetts Elevator and Escalator Regulations, 524 CMR 2.00 through 11.00 and 524 CMR 15.00 through 34.0, and with the Massachusetts State Building Code Paragraph 602, the "Highrise Code".
3. Comply with the accessiblity requirements indicated in 521 CMR.

1.7 WARRANTY:

A. Special Project Warranty: Provide special project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of elevator work during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below specified ratings, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty period is 12 months starting on date of Substantial Completion.

1.8 MAINTENANCE SERVICE:

A. Initial Maintenance Service: Provide full maintenance service by skilled, competent employees of the elevator Installer for period of 12 months following date of Substantial Completion. Include monthly preventive maintenance, performed during normal working hours. Include repair or replacement of worn or defective parts or components and lubrication, cleaning, and adjusting as required for proper elevator operation in conformance with specified requirements. Include 24-hours-per-day, 7-days-per-week emergency callback service. Exclude only repair or replacement due to misuse, abuse, accidents, or neglect caused by persons other than Installer's personnel.

B. Continuing Maintenance Service: Installer shall provide a continuing maintenance proposal to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date construction contract maintenance requirements are concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include but are not limited to the following:

1. Dover Elevator Corp.
2. Montgomery Elevator, Inc.
3. Otis Elevator Co.
4. Schindler Elevator Corp.
5. U.S. Elevator/Cubic Corp.

2.2 MATERIALS AND COMPONENTS:

A. General: Provide manufacturer's standard pre-engineered elevator systems that comply with or fulfill the requirements of elevator schedule sheets at end of this Section, or, at manufacturer's option, provide custom-manufactured elevator systems that will fulfill requirements. Where components are not otherwise indicated, provide standard components, published by manufacturer as included in standard pre-engineered elevator systems and as required for a complete system.

1. The drawings are based on Dover Elevators Model SPF 25/35 and SPF 21/35. Minor variations in specified components to conform to another manufacturer's pre-engineered system will be accepted if, in the opinion of the Architect, they are substantially equal to that specified.

B. Elevator Machines and Equipment: Except as otherwise indicated, provide manufacturer's standard variable-voltage traction-type hoisting machines. Provide geared-type machines.

1. At manufacturer's option, provide variable-frequency a.c.-type hoisting machine in lieu of variable-voltage type.

C. Power Control: Except as otherwise indicated, where variable voltage is required, provide manufacturer's standard solid-state power converters for use with manufacturer's motors on elevator machines (a.c. or d.c.).

1. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system from solid-state converters.

D. Inserts: Furnish required concrete inserts and similar anchorage devices for the installation of guide rails, machinery, and other components of elevator work where installation of devices is indicated as work of another specification section.

E. Guide Shoes/Rollers: Except as otherwise indicated, provide manufacturer's standard units: rollers for speeds in excess of 200 fpm.

F. Car Frame and Platform: Manufacturer's standard welded steel units.

2.3 CONTROL SYSTEMS:

A. General: Provide manufacturer's standard control system for group of elevators as required to provide group automatic operation of the type indicated and defined in the Code as "Operations."

1. 2-Car Group Control - Passenger: Provide solid-state "Group Automatic Operation" as defined in ASME/ANSI A17.1:

   a. "Traflomatic III" by Dover Elevator Corp.

B. Auxiliary Operations/Controls: In addition to primary control system features, provide the following controls or operational features for passenger elevators, except where otherwise indicated:

1. Emergency/standby power operation.
2. Automatic 2-way leveling.
3. Distributed parking of cars during off-peak hours.

C. Emergency Service: Provide manufacturer's standard emergency service operations to meet requirements of referenced codes, including the following equipment:

1. Reduced voltage starters.
2. Firefighter's key switch operation.
3. Rough-in for firefighter's telephone.
4. Car position/status indicators for location in Fire Control Center.

2.4 SIGNAL EQUIPMENT:

A. General: Provide signal equipment for each elevator or group of elevators to comply with requirements indicated below.

1. Provide illuminated hall-call and car-call buttons that

light up when activated and remain lighted until call or other function has been fulfilled; fabricate of acrylic or other permanent translucent plastic.

2. Except for buttons and illuminated signal elements, fabricate signal equipment with exposed surfaces of stainless steel with manufacturer's standard directional polish or satin finish.
3. Car Control Stations: Provide car control station in each car with flush-mounted metal faceplates, containing call button for each landing served and other buttons, switches, and controls required for specified car operation and control. Mount at height complying with ASME/ANSI A117.1. Provide operating device symbols as required by Code. Mark other buttons and switches with manufacturer's standard identification for required use or function.
4. Car Position Indicator: For cars, provide either illuminated-signal type or digital-display type, located near top of each car or in car control station. Include direction-of-next-travel signal if not provided in car control station.

   a. In addition to visual indicator, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

5. Hall Push-Button Station: Provide hall push-button station at each landing for group of elevators.

   a. Locate station between 2 elevators or at location most convenient for approaching passengers. Provide unit with flat faceplate designed for flush-mounting on wall with body of unit recessed in wall.
   b. Provide 2-button station where passengers can travel either direction; 1-button station where only one direction of travel is available and indicate which direction that is.

6. Hall Lanterns: Provide units with illuminated "up" and "down" signal arrows, but provide single arrow where only one direction is possible. Provide units projecting from faceplate for ease of angular viewing, except provide flush units where a location in hoistway entrance frame is indicated. Match materials, finishes, and mounting method of hall push-button stations.

   a. In conjunction with each hall lantern device, provide an audible signal to indicate that a car is arriving in response to a hall call and to indicate direction of car travel. Signal shall sound once for up direction of travel and twice for down direction. At manufacturer's option, audible signal may be placed on each car.

7. Hall Position Indicator: Provide illuminated-signal type or digital-display type, located above each hoistway entrance at each floor. Match materials, finishes, and mounting method of hall push-button stations.

   a. At manufacturer's option, lantern signals may be integrated with hall position indicators.

8. Telephone: Provide rough-in for telephone hand set in each car, contained in flush-mounted cabinet and complete with identification and instructions for use.

2.5 PASSENGER ELEVATOR CAR ENCLOSURES:

A. General: Provide manufacturer's standard cost-reduced pre-engineered car enclosures as indicated. Include ventilation, lighting, ceiling finish, wall finish, access doors, doors, power door operators, sill (threshold), trim, accessories, and floor finish. Provide horizontal sliding doors of manufacturer's standard flush panel type, with operation and number of panels as indicated. Provide manufacturer's standard protective edge trim system for door and wall panels, except as otherwise indicated.

1. Materials and Fabrication: Provide selections as indicated for each car enclosure surface; provide manufacturer's standards, based on the following:

   a. Enameled Steel Panels: Flush hollow-metal construction, fabricated from ASTM A 366 cold-rolled steel, commercial quality, Class 1, matte finish, stretcher leveled. Provide with factory-applied baked-on enamel finish; colors as selected by Architect.
   b. Stainless Steel: AISI type 302/304, with No. 4 satin finish.
   c. Aluminum Sills: Cast or extruded aluminum, with grooved surface, 1/4-inch thickness, mill finish.
   d. Plastic Laminate: High-pressure type complying with NEMA LD3, Type GP-50 (0.05-inch nominal thickness); color, texture and pattern as selected by Architect from standard products available in the industry.
   e. Fabricate car door frame integrally with front wall of car.
   f. Fabricate car with recesses and cutouts for signal equipment.
   g. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent or open egg-crate plastic, of acrylic or other permanent rigid plastic complying with flammability requirements.
   h. Carpeting: ASTM 84, Class B, color and pattern as

selected by Architect from manufacturer's standard range.

i. Certificate Cover: Provide local code inspection certificate cover in each car, clear acrylic in stainless steel frame.

2.6 PERSONAL PROTECTIVE DEVICES:

A. Handrails: Provide manufacturer's standard stainless steel handrails on side walls and back wall unless otherwise indicated; either continuous or segmented units.

B. Door Edge Protective Device: Provide retractable edge shoe on leading edges of elevator entrance doors that causes doors to stop and reopen upon contacting an obstruction in entrance.

C. Photo-Eye Detection Device: Provide electronic photo-eye device with timed cutout, projecting dual light beams across car entrance at 5-inch and 29-inch heights, that when interrupted will cause closing doors to stop and reopen. Provide keyed switch in car operating panel or toggle switch in service cabinet for disconnecting photo-eye protective device.

1. Nudging Feature: After car doors are prevented from closing for a predetermined adjustable time period, through activation of detection device or door edge protective device, a loud buzzer shall sound and doors shall begin to close at reduced rate of speed. Doors shall continue to close unless door edge protective device is activated, which shall cause doors to reopen. Process shall repeat continuously until obstruction is removed from entrance.

2.7 PASSENGER HOISTWAY ENTRANCES:

A. General: Provide manufacturer's standard, pre-engineered, hollow metal type, sliding, door-and-frame hoistway entrances complete with track systems, hardware, safeties, sills, and accessories. Match car enclosure doors for size, number of door panels, and door panel movement. Provide frame-section size and profile to coordinate with hoistway wall construction as indicated.

1. Where gypsum-board type wall construction is indicated, fabricate frames with reinforced head sections; provide sufficient strength without support from wall lintels.

B. Materials and Fabrication: Provide selections indicated; manufacturer's standards, but not less than the following:

1. Enameled Frames: Formed steel with manufacturer's standard baked synthetic enamel finish, colors as selected by Architect.
2. Enameled Steel Panels: Flush hollow-metal construction, fabricated from ASTM A 366 cold-rolled steel, commercial quality, Class 1, matte finish, stretcher leveled. Provide with factory-applied baked-on enamel finish; colors as selected by Architect.
3. Aluminum Sills: Extruded aluminum, with grooved surface, 1/4-inch thickness, mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Prior to commencing elevator installation, examine hoistways, hoistway openings, pits, and machine rooms, as constructed; verify all critical dimensions; and examine supporting structure and all other conditions under which elevator work is to be installed. Notify Contractor in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION OF ELEVATOR SYSTEM:

A. General: Comply with manufacturer's instructions and recommendations for work required during installation.

B. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by Contractor to ensure dimensional coordination of the work.

D. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.

E. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

G. Leveling Tolerance: 1/4-inch, up or down, regardless of load and direction of travel.

H. Set sills flush with finished floor surface at landings. Coordinate with other trades to facilitate and ensure proper grouting of sills.

3.3 FIELD QUALITY CONTROL:

A. Acceptance Testing: Upon nominal completion of each elevator installation and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code and governing regulations or agencies.

B. Advise Contractor, Owner, Architect, and Inspection Department of governing agencies in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION:

A. At time of Substantial Completion of elevator work (or portion thereof), provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

B. Provide similar protective measures for elevator units that will be placed in temporary service, including inspection and maintenance service during period of temporary service.

3.5 DEMONSTRATION:

A. Instruct Owner's personnel in proper use, operation, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

B. Make a final check of each elevator operation with Owner's personnel present and just prior to date of Substantial Completion. Determine that control systems and operating devices are functioning properly.

3.6 ELEVATOR SCHEDULE:

A. Furnish elevators complying with the following minimum requirements:

1. Elevator: Nos. 1 and 2 Grouped
2. Rated Load: Elev. No. 1: 2500 lbs
   Elev. No. 2: 2100 lbs
3. Rated Speed: 350 fpm
4. Travel Distance: 96'-3"
5. Stops: 11 (All Floors plus Basement)
6. Power Supplied: 208 V, 3 Ph, 60 Hz.
7. Control System: Group Control with Microprocessor
8. Auxiliary Operations: Emergency Power Operation; Automatic Standby Operation
9. Car Enclosures: Elev. No. 1: 6'-8" wide x 4'-3" deep, inside; Elev. No. 2: 5'-8" wide x 4'-3" deep, inside.
10. Car Finishes: Front Wall: Stainless Steel; Other Walls: Plastic Laminate; Door Faces: Factory-enameled Steel; Floor: Carpet; Ceiling: Disc lighted.
11. Hoist Entrance: Elev. No. 1: 3'-6" x 7'-0", side opening; Elev. No. 2: 3'-0" x 7'-0", side opening. Finish: Enameled Steel frames and Doors.

END OF SECTION 14210

SECTION 14560 - CHUTES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Types of chutes required include the following:

1. Rubbish (waste) chutes

B. Related Sections:

1. Flashing of roof termination vent is included in Section 07530, "Single Ply Membrane Roofing"; counterflashing is included in this Section.
2. Gypsum board shaft wall construction is included in Section 09270, "Gypsum Board Shaft Wall Systems".
3. Waste compactor units and exterior hopper door for lowrise unit are specified in Section 11170, "Solid Waste Handling Equipment".
4. Hook-ups for water, sprinkler, fire alarm and electrical services are included in the respective Divisions 15 and 16 sections.

1.3 REFERENCE STANDARDS:

A. NFPA Code: Comply with applicable portions of National Fire Protection Association (NFPA) No. 82 Standard on "Incinerators, Waste and Linen Handling Systems and Equipment".

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications, standard details, installation instructions and general recommendations for total pre-engineered chute system. Mark-up data sheets to indicate actual selections for sizes and other details of installation.

B. Shop Drawings: Submit 1/4" scale section/elevation drawing and 1-1/2" scale details of chute fabrication and installation including roof flashing. Show required piping, and wiring connections and conduit runs for wiring.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Cutler-Federal, Inc.; Eaton Park, FL
2. Midland Metalcraft Corp.; Joliet, IL
3. U.S. Chutes Corp.; Brookfield, CT
4. Wilkinson Chutes, Inc.; Stow, OH

2.2 MATERIALS AND FABRICATION:

A. General: Provide manufacturer's standard chute system of type, service, sizes and shapes indicated. Fabricate of metals and finishes as indicated; include support units, expansion joint materials; roof counterflashing and retainer band, roof-termination vent unit; intake chute throat sections located where indicated to accommodate door units as specified, discharge door units of type indicated; flushing units as specified, sprinkler heads where indicated, and manufacturer's standard accessories, fasteners and installation materials.

B. Chute Metal: Aluminum-coated cold-rolled commercial quality, steel sheet ASTM A 463, Type 1 with T1-40 coating, gages as indicated.

1. Gage: U.S. No. 16 (0.062" thick).

C. Chute Intake Door/Frame Units: Provide self-closing units at each landing. Use manufacturer's recommended heights for doors, except comply with Massachusetts accessibility requirements if different. Equip doors with positive latch and latch handle. Provide manufacturer's standard stainless steel door units, AISI Type 302/304 with standard satin finish or No. 3 directional polish.

1. Provide hopper type doors, minimum 15 inches by 18 inches nominal clear opening.

D. UL Labeled Door Units: Provide UL "B" labeled door units (1.0 hour with 30-min temp. rise of 250 deg F, 139 deg C), complete with closers.

E. Chute Discharge Door Units: Provide manufacturer's standard fusible-link, fire-protected, self-closing steel door unit assembly bearing the UL "B" label.

1. Direct (Vertical) Discharge: Provide inclined horizontally- rolling shutter-type door unit.

F. Roof-Termination Vent Units: Provide vent unit with roof-deck flange. Comply with NFPA requirements for full-sized chute extension to 4'-0" above roof, with full diameter screened vent area and metal safety cap or glass explosion-release cap. Provide nonferrous metal roof counterflashing and clamping ring, compatible with chute metal.

G. Fire Sprinklers: Equip chute with sprinkler heads in accordance with NFPA Standard No. 13, ready for piping connections (as work of another specification section). Provide access for maintenance of heads. Except as otherwise indicated or required by governing regulations, provide 1/2" I.P.S. heads, one located in chute above highest intake door, and one located at intake door on alternate floors.

H. Flushing Spray Unit: Provide 3/4" I.P.S. spray head unit in chute above highest intake door, ready for hot water piping connection (as work of another specification section). Provide access for maintenance of head and piping.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with chute manufacturer's instructions and recommendations. Assemble components with tight, nonleaking joints; and anchor securely to supporting structure with sufficient anchorages to withstand impact and wind loading stresses on vent units. Provide for thermal expansion movement of chute sections. Except as otherwise indicated, install chutes plumb, without offsets or obstructions, for free fall of materials within chutes. Install chute systems complete with doors, and with safety and fire-resistive components and accessories.

B. Coordination with Roofing: Where roof deck curb units are not shown to receive chute roof-termination vent units, anchor vent unit support flange directly to deck before installation of roofing/insulation system. Install counterflashing after roofing/flashing system has been installed.

C. Intake and Discharge Doors: Install doors at heights and locations indicated. Provide anchorages, wall/chute interfaces, self-closing operation, self-latching and similar features of installation to comply with labeling and fire-resistive requirements for fire-resistive door construction. Interface door units with throat sections of chutes in a manner which will ensure safe, snag-proof, sanitary depositing of materials in chutes by users.

3.2 TESTING, PROTECTION, CLEANING:

A. Test operate components of chute system upon completion of installation; demonstrate use and safety features to Owner's personnel. Operate doors, locks and interlock system to demonstrate that hardware is adjusted and electrical wiring is connected correctly. Where possible, complete test operations prior to installation of shaft enclosures.

   1. Conduct heat/smoke test in chute in the presence of the Architect, Owner's Representative, and local officials having jurisdiction to demonstrate venting, performance of sensing elements, and operation of sprinkler heads.

B. Cleaning: Following completion of enclosure walls and ceilings, clean exposed surfaces of finished metal components of chute system. Remove foreign substances and repair imperfections in finishes, but do not remove UL labels.

C. Protection: Immediately after completion of installation, install protective seals over trash chute doors to prevent use of chute for construction debris disposal.

   1. Remove seals shortly before date of Owner acceptance.

END OF SECTION 14560

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PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. The drawings, General and Supplementary Conditions of the Contract and Division1 General Requirements apply to the work of this Section.

1.02 SCOPE OF WORK

A. The work covered in this section of the specifications consists of furnishing all plant labor, appliances and materials and in performing all operations in connection with the Plumbing Systems, complete in strict accordance with this Section of the Specifications and plans, and subject to the terms and conditions of the Contract.

B. The Contract Drawings indicate the extent and general arrangement of the systems. If any departure from Contract Drawings are deemed necessary by this Subcontractor, details of such departures and the reason, therefore, shall be submitted as soon as practicable to The Architect for approval. No such departures shall be made without the prior written approval of the Architect.

C. Installation of the systems shall conform to the requirements of the State Fuel Gas and Plumbing Codes, State Plumbing Codes, Life Safety, Public Safety, local codes, and other agencies haqveing jurisdication.

D. It is not intended that the Drawings shall show every pipe, fitting or appliance, but this Subcontractor shall be required to furnish, without additional expense, all material and labor necessary to complete the systems in accordance with the best standard practice of the trade.

E. The equipment shall be installed in accordance with the recommendations of the Manufacturer and the best standard practice for this type of work.

F. Installation Directions: Obtain Manufacturer's printed operating and maintenance instructions for all major pieces of equipment.

G. Operation Instructions: Furnish Manufacturer's printed operating and maintenance instructions for all major pieces of equipment.

H. Objectionable Noise and Vibrations: Mechanical and Electrical equipment shall operate without objectionable noise or vibration, as determined by the Architect.

1.02 SCOPE OF WORK (Continued)

I. Equipment, Design and Installation:

1. Uniformity: Unless otherwise specified, equipment or material of the same type of classification, used for the same purpose, shall be the product of the same Manufacturer.

2. Design: Equipment and accessories not specifically described or identified by Manufacturers' catalog numbers shall be designed in conformity with ASME, IEEE, other applicable technical standards suitable for maximum working pressure and shall have a neat and finished appearance.

3. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; install so that connecting and disconnecting of piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations for indicated arrangements may be made as approved.

J. Protection of Equipment And Materials: Responsibility for care and protection of all materials and mechanical work rests with this Subcontractor at all times until it has been made as approved.

1.03 RELATED SECTIONS:

A. The following sections contain requirements related to this section:

1. Section 03300, "Cast-In-Place Concrete", for sleeves and anchorages furnished under this section but installed by others.

2. Section 04200, "Unit Masonry", for....

3. Section 07530, "Single Ply Membrane Roofing", for installation of roof drains furnished under this Section in roof system.

4. Section 08305, "Access Doors", for access doors furnished by this Section but installed by others.

1.04 FEES, PERMITS AND LICENSES

A. This Subcontractor shall apply and pay for all inspection permits, certificates of inspection, and license fees in connection with this work and shall deliver same to the Owner at completion of work.

1.05 CODES AND REGULATIONS

A. All materials, equipment, work and installation shall be in accordance with the applicable requirements of the American Society of Plumbing Engineers, American Society of Heating, Refrigeration and Air Conditioning Engineers, National Fire Protection Association, American Society of Testing Materials, American Society of Mechanical Engineers, National Electric Manufacturer's Association and any pertinent federal, state and local codes, laws and ordinances. In the event of any conflicts, any conflicts between items of the above requirements or with the Specifications shall be referred to the Architect.

1.06 SUBSTITUTIONS

A. Where a particular product or material is specified by name, it shall be considered as a standard and most satisfactory for its particular purpose in the building. Another product or material equal in all respects may be submitted for consideration as a substitute under the following conditions:

1. No substitutions shall be used unless approved in writing by the Architect.
2. This Subcontractor shall submit Shop Drawings for approval before ordering equipment. The architect reserves the right to disapprove any substitutions without qualification if, in his opinion, the equipment offered does not equal the equipment specified.
3. Acceptance of a substitution by the Architect shall not relieve this Subcontractor from responsibility if the substituted equipment does not perform as per the original Specifications.

1.06 SUBSTITUTIONS (Continued)

B. Any change in cost of other items, in all other trades, as well as under this Section, shall be borne by this Subcontractor, if the changes are a result, directly or indirectly, of a Subcontractor-proposed substitution. All Drawing changes shall be provided by this Subcontractor.

1.07 SHOP DRAWINGS

A. Shop Drawings shall be submitted to the Architect for approval in accordance with provisions of Division 1, showing sizes and arrangement of equipment, foundations and anchor bolts, required motor data, performance characteristics of pumps, control diagrams, pipe diagrams, and hanging details and connections to other work.

1.08 CLEANING

A. Work areas, including any storage areas, shall be kept free from accumulation of waste, materials, dirt, or rubbish. At the completion of the work, this Subcontractor shall remove all dirt and debris cause by this work at the site and shall remove from the premises all his tools, scaffolding, equipment, crating and shipping containers and materials belonging to him, leaving the premises, so far as his work is concerned, broom cleaned in a condition satisfactory to the Architect.

1.09 PERFORMANCE TESTS

A. Upon completion of the work, and after the systems are set, this Subcontractor shall conduct performance tests of the systems. These tests shall be carried out in the presence of the Architect prior to acceptance of the systems and shall be arranged for the purpose of demonstrating satisfactory functional and operating efficiency as well as adjustment. This Subcontractor shall provide a competent Engineer to conduct all tests in the presence of the Architect. The general operating tests shall demonstrate that all equipment is functioning in accordance with the Specifications. This Subcontractor shall furnish all instruments, ladders, lubricants, test equipment, and personnel required for the tests.

1.10 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Printed instructions covering the operation and maintenance of each major piece of equipment shall be posted at locations designated by the Architect. Upon completion of the work and after all tests are completed and the systems set at a time designated by the Architect, the Subcontractor shall instruct a representative of the Owner for eight hours in the proper operation and maintenance of the systems. Both verbal and written instructions shall be furnished in detail. Written sets shall make reference to each item and describe its proper functioning adjustment and maintenance. Four copies shall be furnished, bound in a form suitable for filing.

1.11 EXAMINATION OF SITE

A. This Subcontractor shall visit the site and fully familiarize himself with conditions to be encountered in the performance of the work. Failure to do so shall not relieve this Subcontractor of responsibility for full completion of the work in accordance with the Drawings and Specifications.

1.12 GUARANTEES

A. All parts of the installation are to be guaranteed in writing by this Subcontractor to be free from defects and/or manufacture and installation for a period of one year from the date of written acceptance of the entire building by the Architect. This Subcontractor shall replace, without charge to the Owner, any part or parts of piping and equipment, and all labor and materials required, which fails due to such cause or causes during the guarantee period.

B. This Subcontractor and the Manufacturer supplying each unit of equipment shall guarantee same to be of a capacity and capable of performance as represented by the Manufacturer.

C. The Manufacturer’s written guarantee, where such guarantees extend beyond the one year limit stated herein, shall be delivered to the Architect for transmittal to the Owner.

D. The above guarantees shall be in addition to, not a limitation of, other rights the owner may have under the general conditions.

1.13 RECORD DRAWINGS

A. In accordance with the requirements of the Supplementary General Conditions, furnish and keep on the job at all times, one complete and separate set of blackline prints of the Plumbing work on which shall be clearly, neatly, and accurately noted, promptly as the work progresses, all Architectural and Plumbing changes, revisions and additions to the work. Wherever work is installed than as otherwise shown on the Contract Drawings, such changes shall be noted.

B. Indicate daily progress on these prints by coloring in the various pipes, valves, apparatus, and associated appurtenances as they are erected.

C. No approval of Requisition for Payment for work installed will be given unless supported by record prints as required above.

D. At the conclusion of the work, prepare Record Drawings in accordance with the requirements of the Supplementary General Conditions.

1.14 DRAWINGS AND INTENT

A. This Subcontractor shall refer to the Plumbing Drawings and Architectural floor plans and details for full comprehension of the extent and detail of the work to be performed. These drawings are intended to be supplementary to Specifications, and any work indicated, mentioned or implied in either is to be considered as specified in both.

B. All work shown on the Drawings is intended to be approximately correct to the scale of the Drawings, but figured dimensions and detail Drawings are, in all cases, to assume precedence over them.

C. This Subcontractor, before installing any of his work, shall see that it does not interfere with the clearances required for finished columns, pilasters, partitions, walls and ceilings as shown on the Contract Drawings, Architectural Drawings and details.

D. Work installed by this Subcontractor which interferes with or modifies the Architectural design as shown on the Contract Drawings, shall be changed as directed by the Architect, and all costs incidental to such changes shall be paid for by this Subcontractor.

1.13 RECORD DRAWINGS (Continued)

E. Should it appear that the character of the work herein contemplated or any matter related thereto is not sufficiently explained in the Specifications or Drawings, this Subcontractor may apply to the Architect for further information or Drawings and shall conform to such when given as part of these Specifications as far as they may be consistent with the original Drawings and Specifications.

F. Typical details, where shown on the Drawings, shall apply to each and every item of the project where such items are incorporated. They are not repeated in full on all Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be applicable in full.

G. If this Subcontractor bidding this project believes that any necessary items of work has been omitted from the plans or Specifications, he shall include a list of same with his bid. In the absence of such written notice, it is mutually agreed that the bidder has included the cost of all required items in his bid and that he will be responsible for the satisfactory operation of the entire Plumbing work at no extra cost to the Owner.

H. This Subcontractor shall submit Plumbing plans to the local Plumbing Inspector for his approval before starting work. Any additional changes to comply with Code requirements shall be performed at no cost to the Owner.

1.15 GIVING INFORMATION

A. This Subcontractor shall keep himself fully informed as to the shape, size and position of all openings and foundations required for his apparatus and shall give full information to the General Contractor sufficiently in advance of the work, so that all openings and foundations may be built in advance. He shall also furnish all sleeves and supports hereinafter specified, so that the responsible trade may build same in place.

B. In any case of failure on the part of this Subcontractor to give the proper information as noted above, he shall be required to pay the cost of having the work done.

1.16 OBTAINING INFORMATION

A. This Subcontractor shall obtain detailed information from the Manufacturer's of apparatus which he is to provide, for the proper methods of installation. He shall also obtain all information from the General Contractor and other Subcontractors to insure full comprehension of the work to be done and to assure coordination between work under this Section and of all other work under this Contract.

1.17 ELECTRICAL WORK

A. All Electrical work shall be done in accordance with the Electrical Section of the Specifications.

1.18 SPECIFIED ELSEWHERE:

A. Cutting and patching.

B. Painting.

C. Excavation and backfilling.

D. Electrical power wiring.

E. Fire safing of sleeves and penetrations.

1.19 WORK INCLUDED

A. The work included shall generally consist of, but not be limited to, the following:

1. Furnishing and installation of complete domestic hot and cold water systems, as indicated on the drawings.
2. Furnishing of domestic hot water storage heater and accessories.
3. Furnishing and installation of sanitary and storm drainage to points indicated on the drawings.
4. Complete gas piping system as indicated.
5. Staging, planking, and scaffolding less than eight (8) feet in height.
6. Furnishing and installation of all gas regulators for all gas fired equipment.

1.19 WORK INCLUDED

7. Roof drains are furnished and plumbed under this Section. Installed in roof system by others.

PART 2: PRODUCTS

2.01 MOTORS

A. This Subcontractor shall be responsible for all equipment motors for equipment specified herein. He shall check and verify the available electrical current characteristics.

B. Motors shall be General Electric, Westinghouse, Allis Chalmers, or approved equal. All motors shall be 40 degrees C. rise, built in accordance with I.E.E.E. standards. Each motor shall be equipped with an approved oiling device. Motors less than 1/2 HP shall be single phase motors for 120 volts, 60 cycle.

C. All motor starters, circuit breakers, fused and unfused disconnect switches, push button stations and pilot lights shall be provided under this Section, except where such items are specifically called for herein.

2.02 ACCESS DOORS AND PANELS

A. This Subcontractor shall furnish access doors for access to all concealed valves, cleanouts, drains, etc., as required. These doors shall be in accordance with Section 08308.

B. All access doors shall be located so that the damper can be easily reached, and the size shall be sufficient for this purpose (min. 12" x 15"). When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

C. Access doors shall be prime painted and be complete with cylinder lock and two keys. Doors in fire rated ceilings or walls shall be U.L. labelled and as manufactured by Inland Steel Products Company; milcor type shall be as follows:

Acoustical Drywall Ceiling	"Milcor Type AT"
Gypsum Drywall Ceiling	"Milcor Type L"
Gypsum Drywall Partitions	"Milcor Type M"

D. Access door shop drawings shall be submitted to the Architect for approval.

2.03 VALVE TAGS AND CHARTS

A. This Subcontractor shall furnish and install on each gate valve, globe valve, balancing valve, ball valve, and on all automatic control valves used in his Contract, a 2" diameter brass tag with stamped numerals painted white. The tags shall be attached to the valve handles or stem necks with brass hooks or chains and properly secured.

2.03 VALVE TAGS AND CHARTS (Continued)

B. These numbers shall correspond with numbers indicated for valves and controls on the Record Drawings and on two printed detailed lists. These printed lists shall state the numbers and locations of each valve and controls, and other necessary information such as requiring the openings or closings of another valve when one valve is to be opened or closed.

C. These printed lists shall be prepared in a form to meet the approval of the Architect and shall be framed under glass.

2.04 INSULATION

A. The following piping shall be covered: All hot water piping, hot water recirculation piping above floor, cold water piping, and all above ground and vertical storm drainage piping including the underside of roof drain sumps. Individual fixture runouts in chases need not be insulated.

1. All piping shall be insulated with 4 lb. density fiberglass with vapor barrier jacket; insulation for piping shall be 1" thick.

    a. The insulation shall have a factory applied vapor barrier, all purpose jacket.

    b. Fittings, flanges and valves shall be insulated with 4 lb. density fiberglass with segmented sections of fiberglass, cemented and wrapped, then covered with vapor barrier fiberglass jacket and sealed as specified.

    c. All terminating ends of the pipe covering shall be sealed off with insulated material applied on a bevel. Insulation materials and finish shall be the same as specified for fittings, flanges and valves.

2.04 INSULATION (Continued)

d. Under no circumstances shall stapling of the insulation be permitted.

2.05 PIPING SYSTEMS

Materials:

A. Soil, Waste, Vent & Roof Drainage:

Pipe

Aboveground:

4" and larger	Service weight soil pipe, iron, hubless.
3" and smaller	Type "L" copper tubing, Schedule 40 galvanized steel, cast iron, hubless.

Underground:

All Sizes	Service weight soil pipe, hub type.

Fittings

Aboveground:

4" and larger	Service weight soil pipe fittings. Cast iron recessed drainage fittings. C.I. hubless fittings.
3" and smaller	Cast brass solder joint drainage type or cast iron 125 lb. screwed pattern, C.I. hubless fittings, Schedule 40 PVC or ABS.

Underground:

All Sizes	Service weight soil pipe fittings, hub-end type, resilient gaskets, or lead or oakum.

2.05 PIPING SYSTEMS (Continued)

B. Hot & Cold Water:

1. Pipe

Aboveground

4" and smaller	Type "L" copper tubing.

Underground:

2" and larger	Ductile cast iron cement-lined, class to conform to local water department requirements.
"1 1/2" and smaller	Type "K" hard drawn copper tubing painted one coat of asphaltum after test.
Fittings:	Mechanical joint or as required by local water department.
1 1/2" and smaller	Cast brass or wrought copper solder joint type.

C. Solder:

Underground	Type "K" copper, silver brazed.
Aboveground	Type "L" copper, 95-5 grade, no lead.
Flux	Type "L" copper, Nokrode solder paste.

D. Unions:

2" and smaller	Screwed, 600 lb., nonshock cold WOG, malleable iron, brass to brass seat.
Copper Tubing	Ground-joint, bronze, 200 lb. WSP.

2.05 PIPING SYSTEMS (Continued)

E. Joints:

2" and smaller	Screwed joints shall be made with piping compound.

F. Valves:

3" and smaller (BALL)	1b. WSP all bronze threaded ends as applicable
4" and larger (GLOBE)	125 lb. WSP flanged, iron body, bronze mounted, OS&Y rising stem, solid wedge designed to permit repacking under pressure.

Check

2" and smaller	125 lb. WSP, all bronze horizontal swing type screwed caps, bronze disc, designed to allow regrinding of seat without removal of valve body, solder or threaded ends as applicable.

G. Gas Piping

Pipe

2" and smaller	
2 1/2" and larger	Schedule 40 steel.

Fittings

2 1/2" and larger	Schedule 40 steel welded or flanged.
2" and smaller	125 lb. malleable iron screwed.

2.06 VALVES

A. Each system shall be provided with valves as required by code and as shown on drawings valves shall be installed to facilitate operation, replacement and repair. Provide access panels where valved are concealed behind ceiling or wall. Ball valves will not be permitted on services larger than 1".

B. Gate:

2" and smaller	125 lb. WSP all bronze, nonrising stem, screwed bonnet, one piece wedge, designed to permit repacking under pressure, solder or threaded ends as applicable.
2 1/2" and larger	125 lb. WSP flanged, iron body, bronze mounted, OS&Y rising stem, solid wedge designed to permit repacking under pressure.

2.06 VALVES

C. Gas cocks 2 1/2" and larger shall be all iron, flanged ends, 125 psi working pressure. Gas cocks 2" and smaller shall be bronze, screwed ends, 125 psi working pressure.

D. Option: Contractor may use ball valve, 125 lb. WSP.

2.07 FLOOR DRAINS, ROOF DRAINS, AND CLEANOUTS

A. Floor and roof drains shall be Josam, Zurn, Wade or Jay R. Smith. Jay R. Smith catalog numbers are used to denote quality of the product required.

1. Floor Drain A - Shower, Toilet & Laundry Room - Jay R. Smith 2010AB, 6" round nickel bronze top with sediment bucket.

2. Floor Drain B - Mechanical Room - Jay R. Smith 2350-M with sediment bucket and ductile iron grate.

3. Floor Cleanouts - Jay R. Smith 4245 with nickel bronze top. Carpet cleanout marker shall be provided where carpeting is installed.

2.08 HOSE BIBBS

A. Hose bibbs shall be 3/4" female hose bibbs with loose key, chrome plated with integral vacuum breakers.

B. Chicago #952, T & S Speakman.

2.09 WALL HYDRANTS

A. Wall hydrants shall be nonfreeze type, Jay R. Smith 5610 with integral vacuum breaker.

2.10 SHOCK ABSORBER

A. Jay R. Smith Model 5000 water hammer arrestor.

2.11 WATER METER

A. Provide water meter assembly and connection to underground domestic water system as indicated. Meter shall be flanged disc type with straight-reading register indicating cubic water. Assembly shall be complete with flanged cast iron fittings 125# (0.9 MPA) IBBM gate valves, and mechanical joint to flange adapter.

1. Meter shall comply with BWSC requirements.

2.12 GAUGES

A. Pressure gauges shall be No. 800 Trerice Co., or similiar as manufactured by U.S. Gauge or Taylor, with 4 1/2" diameter dial. Gauges on the hot water system shall have a range of 0 to 100 psi. Each gauge shall be provided with a shutoff gauge cock. Gauges shall be installed at each pump suction and discharge and elsewhere as indicated.

2.13 THERMOMETERS

A. Thermometers shall be installed as indicated on the drawings and in such a position that they indicated accurately the temperature surrounding the thermostat element. Thermometers shall be Taylor Instrument Company Industrial Type, complete with 9" scale, permacolor liquid, union hub and separable wells. Extension neck wells shall be used on insulated piping and equipment. Equivalent thermometer shall have a range of 30 degrees to 240 degrees F on hot water system with 2 degrees F scale division.

2.14 HOT WATER STORAGE TANK

The hot water storage tanks shall be complete, pretested hot water storage vessels. The pressure vessel shall meet all the applicable requirements for ASME Section IV, HLW stamped vessels and shall be accordingly stamped and identified. It shall be National Board inspected and stamped for 125 PSIG maximum working pressure. The Manufacturer shall provide the owner with a copy of the Manufacturer's Data Report. Hot water storage tank shall be furnished and installed in accordance to all applicable state and local codes. Tank is factory painted with one coat of industrial grade red oxide primer. Each unit is to manufactured by PRECISION Parts Corporation, Morristown, Tn., size and storage capacity as scheduled on the drawings.

The pressure vessels shall be insulated with 2" of 3/4 lb density fiber glass insulation or equivalent and enclosed in a sheet steel cabinet of a minimum 18 gauge thickness which is painted with air dried enamel.

Tank shall be lined with Copper Coat having a ten year non prorated warranty. Sample warranty shall be submitted with shop drawings for approval. All openings shall be of steel copper coated.

Tanks shall have 12 inch high support as required.

Lifting lugs for handling shall be provided.

2.15 FIXTURES

All fixtures shall be as manufactured by American Standard, Eljer, Crane, Kohler, Universal Rundle, or Briggs. Color to be white, and all china fixtures shall be of same manufacturer.

P-1 Water Closet - American Standard 2139.116 1.5 gal. Water-Saver Cadet", floor outlet, tank type, with regular trim, syphon jet type, close coupled tank. Beneke 880 solid plastic seat and closed front cover; C.P. 3/8" supply with stop.

P-1A Handicapped Water Closet - American Standard 2109.405 elongated "Water-Saver Cadet" floor outlet, tank type with regular trim, syphon jet type, close coupled tank. Beneke 520 solid plastic seat and closed front cover cover; 3/8" supply with stop.

2.15 FIXTURES (Continued)

P-2 Lavatory - American Standard 0476.289 "Aqualyn" self-rimming vitreous china Moen #8935 faucet and pop-up drain, (pr.) C.P. flexible supply pipes with stops. C.P. trap with bottom cleanout and cover tube to suit code.

P-2A Handicapped Lavatory - American standard 0195.289 "Roxylyn" 24" x 20", faucet holes at 4" centers. Moen #8820 with wrist handle. 3/8" supplies with stops. American Standard 7723.018 offset grid, C.P. trap to suit. Front lip of lavatory shall be 1'-10" from finished wall. Provide (CP) 2" escutcheons.

P-3 Bath - American Standard Aquarius 2508 or 2509 right or left hand, 5' fiberglass bath tub, non-skid bottom, bottom outlet. Provide Sterling tip-toe drain and overflow fitting. Moen #8339 spout, showr head and valve, 1 1/2" trap to suit.

P-3A Handicapped Bath - American Standard "Mass Special" fiberglass tub, drain, trap and overflow fitting shall be same as "P-3". Shower valve shall be Moen #8339, non-scald valve, diverter with volume control tub spout, Moen flow hand spray unit with spray head, 24" chrome bar with adjustable slide, and in-line vacuum breaker, wall connections and flange and integral stops. Mount all valves and sidewall.

P-4 Kitchen Sink - Moen Model ##-2522, 25" x 22", 20 gauge finish stainless steel, self-rimming with faucet ledge back. Moen #8722 fitting with spring. Pair 1/2" copper stops and 1 1/2" trap to suit, and D.W. connector. Provide Insinkerator Badge V disposal with cord and 1/2 hp motor.

P-4A Handicap Kitchen Sink - Moen Model #6254 left or right hand 25 x 21 handicaped kitchen sink with Moen #8798 fitting, offset drain, domestic water connector/ stops insulate all exposed piping and provide Badge V disposal with cord.

P-4B Kitchen Sink - Moen #E-3322 - 33 x 22 20 gal. standard sink-(same trip as P4)

P-5 Washing Machine Connection - Supply and install (2) 1/2" hise bibbs and (1) 2" P-Map.

P-6 Slop Sink - Flat #FL-1 with legs, 24" sink 1 1/2" P-Trap, stops and risers, and Moen 4" fitting #4910

2.15 FIXTURES (Continued)

P-7 Sill Locks - Zurn Model #1310 frost proof anti-siphon valve.

2.16 DOMESTIC BOOSTER PUMP

A. Furnish and install a prefabricated Model two pump water pressure booster system as designed and manufactured by SyncroFlo, Inc., Altlanta, GA (telex 542945). The system shall be capable of automatically providing a constant system pressure of 80 psig while supplying a flow rate from 0 to 150 GPM with a suction pressure of 80 psig minimum, psig maximum. System shall automatically provide complete pump shutdown during low flow conditions while maintaining constant system pressure. The system shall automatically store a minimum of 50 gallons of usable water to maintain system pressure whem operating a minimum suction pressure.

B. Pumps - Pumps shall be SyncroFlo constant speed single stage end-suction design of cast iron bronze fitted construction, equipped with mechanical shaft seal. Each pump shall have vibration isolating mounts and be fitted with a separate prewired temperature probe and approved electric purge valve installed immediately upstream of each PRV. Pump No. 1 shall be a SyncroFlo Model DF-73 rated 150 gpm at 112 ft. head. Pump No. 2 shall be a SyncroFlo Model DF-73 rated 150 GPM at 112 Ft. head.

C. Motors - Pump No. 1 shall be driven by a 3, volt, phase, 60 hertz, RPM, drip-proof motor. Pump No. 2 shall be driven by a HP, volt, phase, hertz, RPM drip-proof motor. Each pump motor shall meet NEMA standards and operate within the nameplate horsepower at any point on the pump capacity head curve. Motors shall have class "F" insulation with 1.25 service factor and be of the high efficiency type.

D. Pressure Regulating Valves - Constant system pressure shall be maintained by a flanged pilot-operated diaphragm type combination pressure regulating and non-slam check valve on each pump discahrge line. Valve body shall be cast iron with cover and disc guide, disc retainer, and diaphragm washer. The valve body shall be suitable for operation at maximum pump pressure plus maximum suction pressure.

2.16 DOMESTIC BOOSTER PUMP (Continued)

E. Lead pump Shutdown controls; Remote Tank - Provide a factory pre-charged, ASME code and NB stamped, 170 gallon 200 PSIG rated SyncroFlo Hydrocumulator tank. Construction features shall include an ASME relief valve, and air fill valve, an air pressure gauge, a drain valve, an a replaceable flexible membrane to separate air and water.

F. Pump Sequencying:

to GPM - Pump No. 1 only shall run.

to GPM - Pump Nos. 1 and 2 shall run together.

The lag pump shall be sequenced on and off by a factory set, direct sensing, pressure switch with minimum run timers.

G. Power And Control Panel - Furnish a single enclosure SyncroFlo power and control panel (NEMA I). Enclosure shall be steel and furnished with an industrial grade enamel. It shall house all control components and include 115v control transformer with control power switch, indicating lights, manual alternator, visual alarm system and other necessary controls. Include for each pump a fused disconnect switch with external operating handle, a magnetic starter with 3-leg overload protection, a running light, a multiple position selector switch. All of the above shall be factory and internally prewired and tested in accordance with the provisions of the National Electrical Code. All control wires shall be individually numbered and each component shall be labeled accordingly. All internal wiring shall be copper stranded, A.W.G. with a minimum insulation of 90 degrees C. The complete assembly shall be the UL listing mark for industrial control panels.

H. Instrumentation And Emergency Controls - Each pump shall have anti-vibration pads, a temperature probe, and an electric purge valve. Include individual 2 1/2" ASA, grade "A" pressure gauges for indicating system and suction pressure. Include pressure switches for

2.16 DOMESTIC BOOSTER PUMP (Continued)

abnormally low suction pressure to activate the manual reset alarm systems. All pressure switches, as well as the system and suction pressure gauges, shall be control panel mounted.

I. Factory Prefabrication - The entire booster system shall be factory-prefabricated in a common structural steel stand with all interconnecting piping and wiring completed and operationally tested prior to shipment. The complete package shall also include isolation valves on the suction and discharge of each pump. Type "L" copper suction and discharge pipe manifolds, as well as copper tubing with shutoff cocks for gauges and pressure switches, will be furnished and assembled. The only field connections required will be system suction and discharge headers, the drain tube, and the power connection(s) at the control panel.

J. Factory Test - The factory shall certify in writing that the water pressure booster system and its component parts have undergone a complete electric and hydraulic test prior to shipment. The test shall include a system operating flow test from 0 to 100% design flow rate under the specified suction and net system pressure conditions.

K. Guarantee - The SyncroFlow water pressure booster system shall be guaranteed in writing by the manufacturer for a period of one year from date of shipment against defects in design, materials or construction.

L Start-Up Service - The service of a factory-trained representative shall be made available on the jobsite to check installation and start-up and instruct operating personnel.

PART 3: EXECUTION

3.01 GENERAL

A. This Subcontractor, under this Section of the Specifications, shall be responsible for the supervision of his personnel and the inspection of equipment and appliances provided by him to assure a safe working environment in compliance with O.S.H.A. regulations. In addition, this Subcontractor shall immediately report to the General Contractor, in writing, any possible violations of said O.S.H.A. regulations observed in areas occupied by his personnel. Failure to notify the General Contractor shall constitute this Subcontractor's acceptance of the working conditions and the responsibility, therefore.

3.02 TEMPORARY OPENINGS

A. This Subcontractor shall ascertain from his examination of the Drawings whether any special temporary operations in the building for the admission of apparatus furnished under this Contract will be necessary. He shall notify the General Contractor accordingly. He shall pay all costs of making such openings in case of failure to give his notification in time for the General Contractor to arrange for same during construction.

3.03 EQUIPMENT BASES

A. This Subcontractor shall provide metal and other bases and supports not part of the building for all equipment, and erect all structural supports of proper size, type, and strength throughout the work wherever necessary. This work and material shall be complete and must be approved by the Architect in every particular.

3.04 PROTECTION OF WORK AND PROPERTY

A. This Subcontractor shall take particular care to protect any finished work from injury or defacement and must remedy, at his own expense, any injury caused thereto by his operation or the operations of any other Subcontractors.

B. At all times, when the temperature is low enough to require it, this Subcontractor shall heat the materials subject to injury by frost, such as caulking compounds, mastic, etc.

3.04 PROTECTION OF WORK AND PROPERTY (Continued)

C. This Subcontractor shall provide suitable protection of all equipment furnished under this Contract while stored at the job site and after installation. This protection shall be suitable to guard equipment items against damage from the weather or from construction activities. Such protection shall not be removed until directed by the Architect. Piping and equipment shall be kept in a clean condition, free from dirt and debris. All piping and equipment items shall be thoroughly cleaned before the start-up of any equipment or system.

3.05 INSTALLATION OF PIPE AND FITTINGS

A. Furnish and install piping approximately as indicated, straight, plumb and as direct as possible; form right angles on parallel lines with building walls.

B. Keep pipes close to walls, partitions, ceilings, offset only where necessary to follow walls, as indicated.

C. Locate groups of pipes parallel to each other; space them at distance to permit applying full insulation and to permit access for servicing.

D. Design, fabricate and install all piping in accordance with the American Standard Code for Pressure Piping, ASA B31.1.

E. Piping shall be accurately cut to measurements established in the field and worked into place without springing or forcing.

F. All piping shall be reamed to be free of burrs.

G. Keep piping free from scale and dirt; protect open ends whenever work is suspended during construction to prevent foreign bodies entering and lodging there; use temporary plug, burlap, or other approved material for protection.

3.06 INSTALLATION OF UNIONS

A. Provide unions, screwed or flanged, where indicated and in the following locations, even if not indicated:

1. In long runs of piping, to permit convenient disassembly for alterations or repairs.

2. In bypasses around equipment.

3.06 INSTALLATION OF UNIONS (Continued)

3. In connections to tanks, pumps, and other equipment requiring disconnection for repairs and/or replacement; location between shutoff and equipment.

3.07 PIPE INSULATORS

A. Nonmetallic pipe insulators shall be installed between all copper and galvanized piping to prevent galvanic corrosion. Insulators shall contain a plastic separation for metallic, nonmetallic contact.

3.08 EXPANSION

A. Provide for taking up expansion in hot water mains, risers by means of loops, offsets, guides and anchors where indicated and/or required.

B. Make riser offsets in a manner to avoid pocket forming due to expansion.

3.09 INSTALLATION OF VALVES

A. Provide shutoff valves where indicated and specified, and in the following locations, even if not indicated or specified:

1. Risers and main branches at points of takeoff from their supply or return mains.

2. Individual equipment and fixtures at inlet and outlets, to permit unit removal for repairs without interferences with remainder of system.

B. Locate valves for easy access and operation.

C. Do not locate valves with stems below horizontal.

3.10 WORKMANSHIP

A. All work shall be executed in a workmanlike manner, and shall present a neat and mechanical appearance.

B. All pipes shall be run parallel or perpendicular to building lines and shall be properly graded.

C. All pipe connections shall be made in a manner which will allow for freedom of movement during expansion/contraction.

3.10 WORKMANSHIP (Continued)

D. All installation methods and materials shall comply with all State and local standards.

E. All Plumbing work shall be in accordance with the latest approved BOCA Plumbing Code," as used by the Board of State Examiners of Plumbing.

3.11 FIXTURES

A. Clean all exposed metal surfaces of grease, dirt, or other foreign material. Chrome plated piping, fittings, and trimmings shall be polished on completion.

B. Fixtures shall be properly protected from damage during construction period and shall be cleaned in accordance with Manufacturer's instructions.

C. This Subcontractor shall be responsible for the location of supports for fixtures.

D. Fixtures and equipment shall be provided with a separate stop valve for hot and cold water.

E. Unless otherwise noted, all exposed trim above and below fixtures shall be brass chrome plate.

F. On completion of work, adjust stop valves, flush valves, control valves, and faucets.

G. Fixtures shall be set level and in proper alignment with reference to adjacent walls.

3.12 SLEEVES AND ESCUTCHEONS

A. Pipes passing through wood and concrete floors and interior walls shall run through pipe sleeves, two pipe sizes greater than the pipe passing through and caulked as below. This Subcontractor shall be responsible for furnishing and setting in place the sleeves. Provide escutcheons for exposed vertical and horizontal piping at floors, walls and ceilings.

3.13 PROTECTION OF PIPES

A. All open ends of pipe shall be properly capped or plugged during construction period to prevent entrance of foreign materials.

3.13 PROTECTION OF PIPES (Continued)

B. Materials, fixtures and fittings shall be properly protected and all pipe openings shall be temporarily closed so as to prevent obstructions and damage.

C. Water closets, lavatories, bath tub units, urinals shall be protected to prevent use. Post notice prohibiting the use of the fixtures prior to completion.

3.14 JOINTS

A. Joints and connections shall be gas tight and water tight for the pressure required by test.

B. Cast iron hub and spigot soil pipe joints shall be made with oakum and molted lead, resilient approved type of gasket, or approved type of clamps for hubless soil pipe.

C. Screwed Pipe: Graphite and oil compound applied to male threads only.

3.15 SOIL, WASTE, DRAIN AND VENT PIPING

A. Horizontal drainage piping shall be installed with a fall of not less than 1/8" per foot for 4" and larger, and not less than 1/4" per foot for 3" and smaller, except where otherwise indicated.

B. Piping in ground shall be laid on a firm bed for its entire length, except where support is otherwise provided and approved by the Architect before backfilling.

C. Vents shall be provided in accordance with the local requirements.

D. Vent stacks less than 3" in size shall be increased to 3" before going through roof and extend to 2 feet above roof.

3.16 DOMESTIC WATER PIPE, FITTINGS AND CONNECTIONS

A. Provide shock absorbers on both hot and cold supplies to each fixture or group of fixtures.

3.16 DOMESTIC WATER PIPE, FITTINGS AND CONNECTIONS

B. All cold water piping shall be properly graded and valves installed at all low points so that the piping can be properly drained. Minimum 1 inch in 20 feet.

3.16 DOMESTIC WATER PIPE, FITTINGS AND CONNECTIONS (Cont'd)

C. Changes in sizes to be made with reducing fittings.

D. Piping where not concealed shall run as high and as close as possible and parallel to the walls or building columns.

E. Vent all high points. Drain all low points with 3/4" hose bibbs.

F. All hot water piping shall be pitched up towards fixtures and riser for proper air relief.

G. No water piping shall be installed within exterior wall.

3.17 CLEANOUTS

A. Provide cleanouts every 50 feet for pipe 4" or smaller and at every change in direction of waste,soil and storm lines.

B. Provide cleanouts at or near the foot of each vertical waste, soil or storm stack and on concealed piping.

C. Cleanouts shall be extended through and terminate flush with the finished wall or floor with a brass flush deck plate. Wall cleanouts shall be set at a minimum height of 12" to center of cleanout.

D. Where it is necessary to conceal a cleanout plug, a covering plate shall be provided which will permit ready access to the plug.

3.18 TESTS AND INSPECTION

A. Plumbing work shall be inspected and tested according to the BOCA Plumbing Code.

1. Storm, Sanitary, And Roof Drains: Water filled to roof. Hold for 1 hour. If the system is tested in sections, each opening except the highest opening or the section under test shall be tightly plugged, and each section shall be filled with water and tested at least a 10' head of water.

2. Water Lines: 125 psi pressure; hold for 30 minutes.

3. Gas Piping: 3" mercury; hold for 30 minutes.

3.18 TESTS AND INSPECTION (Continued)

B. This Subcontractor shall provide all necessary labor and materials to accomplish tests as part of this Contract.

C. Material found defective during testing procedure shall be replaced with new material of the quality required by the Specifications at no additional cost.

D. Defects shall be repaired by replacing the defective parts with new material. No caulking of leaks or joints shall be permitted.

3.19 INSULATION

A. General:

1. Do not begin insulation work until job conditions are conducive to proper installation and protection of insulation work.

2. All surfaces shall be clean and dry when insulating covering is installed. All foreign matters such as rust, scale, dirt, etc., shall be removed.

3. All joints of insulating covering shall be smooth and even with jackets drawn tight and smoothly cemented down at all longitudinal and end laps with fireproof adhesive.

4. Surfaces of insulating covering shall be smooth and even with jackets drawn tight and smoothly cemented down at all longitudinal and end laps with fireproof adhesive.

5. All pipe covering shall be continuous and shall extend full thickness through walls and floors, and sleeves shall be selected accordingly.

6. All insulation herein specified shall have a maximum flame spread of 25 and a maximum smoke developed of 50 and shall be in strict accordance with U.L. and F.I.A. recommendations. This Subcontractor shall verify all insulation prior to submitting Shop Drawings.

3.20 ORDER OF WORK

A. The Plumbing work shall be performed in harmony with the other work on the building, and at such times as not to interfere with or hold back in an unwarranted manner to other trades.

B. The Plumbing work shall be installed as fast as conditions will allow, and it must be ready for use when the building is complete.

C. In the event that any changes are required because of the installation of any substitutions, the cost of all those changes shall be borne by this Subcontractor making substitutions.

3.21 COORDINATION

A. Coordinate and install concealed piping, inserts, sleeves, anchors and other concealed or embedded items, so that this work is properly completed, before concrete partitions or plastering are placed. This Subcontractor shall coordinate his work with other trades to avoid interferences. Cutting of the work of other trades is forbidden.

3.22 FLOOR AND WALL PENETRATIONS

A. Waterproof membrane of the structural floor slabs and foundation walls of the building shall be penetrated only at locations approved by the Architect, and in a manner acceptable to the Architect. Proposed penetration points, size openings, and method to be used shall be submitted to the Architect for approval prior to the installation of same.

3.23 COOPERATION WITH OTHER CONTRACTORS

A. This Subcontractor shall perform his work to conform to the work of other Subcontractors, and he shall install and relate his work to their's at all times and in such manner as to cooperate with them and not to delay or interfere with them.

3.24 HANGERS AND SUPPORTS

A. Piping in the Plumbing systems shall be installed without undue strains and stresses and provision shall be made for expansion, contraction, and structural settlement.

3.24 HANGERS AND SUPPORTS (Continued)

B. Cast iron pipe shall be supported at each hub on horizontal runs, and its base on vertical runs.

C. All screwed piping and copper tubing 1 1/4" and larger shall be supported at approximately 10' intervals on horizontal runs and at its base and at each floor on vertical runs. All piping 1" and smaller shall be supported on 6'intervals.

D. All hangers and supports in contact with copper tubing shall be copper plated.

E. Hangers for piping 2" and smaller shall be Calco, Grinnell or Carpenter-Patterson Type No. 1A band with 3/8" rod. Piping 2 1/2" and larger shall be Clevis type with 1/2" rod.

F. Hangers or supports shall be placed within 1' of each horizontal elbow. Vertical runs of pipe not over 15' in length shall be supported by hangers placed not over 12" from the elbow connecting horizontal runs.

G. All hangers on insulated line shall be sized to fit the outside diameter of the pipe insulation. Provide pipe covering protection saddles at all hangers on insulated lines. Provide sixteen (16) gauge sheetmetal shields, 12" long and covering 180° of arc on the covering at all hangers on insulated lines.

3.25 CHLORINATION

A. All water piping shall be filled with a solution of chloride and water (0.5 to 1.5 ppm free chloride) and allowed to stand for at least 48 hours.

B. After the system has been flushed, drained and refilled, a sample of the water shall be taken to the local Health Department for a test. If it has been found that all impurities have not been removed, the above shall be repeated until the system is free of all impurities and approved by the Department of Health.

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PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. The drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this Section.

1.02 SCOPE OF WORK

A. The work covered in this Section of the Specifications consists of furnishing all plans, labor, equipment, appliances and materials and in performing all operations in connection with this Fire Protection system, complete, in strict accordance with this Section of the Specifications and the applicable drawings and subject to the terms and conditions of this Contract.

B. The Drawings shall be followed as closely as actual construction of the building and work of other trades will permit. It is intended that heads shall be set in accordance with the Architectural and detail drawings of the structure. All changes from the Drawings necessary to make the work conform to the building as constructed to fit the work of other trades, shall be made as directed.

C. Before buying or installing any equipment, complete working plans shall be submitted and approved by the Insuring Agency. The word "approved", as used in the Specifications, means acceptable to the Insuring Agency and the local Fire Department.

D. After approval of working plans is received, three copies shall be submitted to the Architect for comments.

E. The entire staging, planking and scaffolding shall be furnished, installed, and maintained by General Contractor at no cost to the Sprinkler Subcontractor.

F. The following work shall be included within this Section of the Specifications:

1. Sprinklering of entire building.

1.02 SCOPE OF WORK (Continued)

2. Stairwell, where indicated, shall have a stand pipe with 2 1/2" x 1" reducer and capped connection at each floor. A pressure reducer shall be provided ahead of 2 1/2" valve to insure 65 psig pressure at valve.

3. A fire pump shall be installed to provide adequate pressure for sprinkler system.

4. Necessary siamese connections.

5. Staging, planking, and scaffolding less than eight (8) feet in height.

6. Low pressure sensor and alarm on incoming water - locate between water inlet and backflow preventer set at 20 psig.

7. Testing of system when requested by local inspector.

1.03 WORK SPECIFIED ELSEWHERE

The following is specified under other Sections of the Sp[ecifications:

1. Excavation and backfilling.

2. Painting.

3. Fire Extinguishers and Cabinets.

4. Electrical work.

5. Access doors.

6. Water service.

7. Fire stopping.

1.04 CERTIFICATES OF APPROVAL

A. Certificates of approval of the completed installation by the Insuring Agency and the local Fire Department shall be furnished to the Architect.

1.05 FEES, PERMITS AND LICENSES

A. This Subcontractor shall obtain and pay for all inspection permits, tests, utility back-charges, certificates of inspection and license fees in connection with his work, and shall deliver same to the Owner at the completion of the work.

1.06 CODES AND REGULATIONS

A. All materials, equipment, work and installation shall be in accordance with the applicable requirements of the National Fire Protection Association, American Society of Testing Materials, and any pertinent federal, state and local codes, laws, and ordinances with requirements have precedence over the Specifications in the event of any conflicts. Any conflicts between items of the above requirements or with the Specifications shall be referred to the Architect.

1.07 TESTS

A. After completion, specify required tests. Confirm with BFD amd Boston ISD the system shall be subjected to hydrostatic pressure of not less than 200 psi for a period of two hours in the presence of the Architect. Any defects showing during the test period shall be repaired by this Subcontractor at his expense. Defects shall be repaired by replacing the defective parts with new material. No caulking of leaks or joints shall be permitted.

B. After completion of tests and approval by the Architect, this Subcontractor shall furnish the Architect a certificate as required by Pamphlet Nos. 13, 14 and 20 of the National Fire Protection Association.

1.08 DAMAGE TO OTHER WORK

A. This Subcontractor shall be held responsible and shall pay for all damage to other work or workmen. Repairing of such damage shall be done by this Subcontractor who installed the work and as directed by the Architect.

1.09 GUARANTEE

A. All equipment, labor and materials furnished under this Section of the specifications shall be guaranteed for a period of one year from the date of beneficial occupancy thereof against defective materials, design and workmanship. Materials and/or equipment found defective shall be replaced with new materials and/or equipment at

1.09 GUARANTEE (Continued)

this Subcontractor's expense. This Subcontractor shall guarantee that all elements of the system are of sufficient capacity to meet the requirements set forth herein. Upon receipt of notice from the Owner or Architect of any failure during the guarantee period, the defect shall be remedied promptly by and at the expense of this Subcontractor.

1. The above guarantee shall be in addition to, not a limitation of, other rights the owner maqy have under the general conditions.

B. This Subcontractor shall see that there is no conflict in the work and no conflict with the work of other trades. Any conflict shall be immediately brought to the attention of the Architect.

C. In general, the plumbing piping and ventilation systems shall be given the right of way. All piping shall be installed to conform with finished work as shown on the Architectural Drawings, and shall be installed to clear all electrical equipment indicated.

1. Do not install any pipe or equipment so as to alter the appearance of the finished work without approval.

1.10 VISIT TO SITE

A. This Subcontractor, estimating and submitting a bid for the work covered by this Section of the Specifications, shall visit the site and view conditions as they exist prior to submission of a bid. The submission of a bid shall be taken as evidence that the bidder has examined existing conditions and has satisfied himself as to the various requirements, obstacles, and advantages of performing the work. No subsequent allowances will be made in this respect due to the failure of this Subcontractor to meet the full requirements of this Specification.

1.11 RECORD DRAWINGS

A. In accordance with the requirements of the Section 01700, "Project Closeout", furnish and keep on the job at all times, one complete and separate set of blackline prints of the fire protection work on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all architectural and fire protection changes, revisions, and additions to the work. Wherever work is installed than as otherwise shown on the Contract Drawings, such changes shall be noted.

B. Indicate daily progress on these prints by coloring in the various pipes, valves, apparatus, and associated appurtenances as they are erected.

C. No approval of requisition for payment for work installed will be given unless supported by record prints as required above.

D. At the conclusion of work, prepare record drawings in accordance with the requirements of the Section 01700.

2.01 MATERIALS

A. All materials and equipment used in the installation of the sprinkler system shall be listed in the Underwriters Laboratories, Inc. "Fire Protection Equipment List". Sprinkler heads shall be provided for temperature conditions as required. Manufacturer's and product names are to establish a quality of items; other manufacturers' products may be submitted for approval to items, and the decision of the Architect shall be final.

2.02 PIPING

A. Sprinkler and fire line piping 2" and smaller shall be black steel conforming to ASTM A53 or A120, Schedule 40. Fittings for sprinkler and fire line systems shall be 125 lb. cast iron sprinkler type, screwed pattern fittings. Sprinkler and fire line piping 2 1/2" and larger may be Schedule 10 with grooved ends and suitable for Victaulic fittings.

B. Unions for Steel Piping: All unions 2" and smaller shall be 150 lb. malleable iron unions with brass or iron seats.

C. Jointing Materials:

1. Reducing flanges shall not be used.

2. Threaded joints shall be made with lubricant (red lead or linseed oil) or other approved compound on the male thread only. All burrs and/or cutting shall be removed, and pipe shall be reamed or filed out to not less than original diameter. Piping shall be kept free from scale or dirt.

3. Threads and screwed fittings shall be American National Paper pipe thread.

D. Hangers, Anchors and Inserts: Hangers or brackets shall support the piping from the building structure to maintain the required grade and pitch of the pipe lines, prevent vibration, secure the piping in place, and provide for expansion and contraction.

1. Do not anchor pipe hangers to metal decking.

2.02 PIPING (Continued)

E. Sleeves and Escutcheons:

1. Sleeves shall be installed around all piping passing through, masonry foundations, walls, slabs, partitions, or other building construction. This Subcontractor shall be responsible for the location, setting, and anchoring of sleeves in substantial manner. All sleeves installed in vertical position shall be constructed of galvanized sheet metal pipe projecting 1/2" above finished floor. All sleeves installed in horizontal position shall be constructed of standard weight steel pipe. Sleeves in floor or exterior building walls below grade shall be installed with approved caulking between sleeves and piping to make it waterproof. Firestopping is specified in Section 07270.

2. This Subcontractor shall provide and set inserts and sleeves. Reference Section 03300 "CIP".

2.03 PIPE EXPANSION AND MOVEMENTS

A. Approved means of relieving movement in long straight runs of sprinkler piping, where serious movement of sprinkler pipe is likely, shall be provided.

2.04 SPRINKLER HEADS

A. Sprinkler heads shall be pendent or sidewall type, chrome plated with escutcheons where hung ceilings occur; semi-recessed type. Otherwise, heads shall be upright type or sidewall type as required. No escutcheons at GWB.

B. The temperature rating of the sprinkler heads shall conform to the requirements of NFPA.

2.05 GATE VALVES

A. 2 1/2" and larger shall be iron body, bronze-mounted, OS&Y rising spindle, Underwriters approved, Jenkins 825C or similar by Nibco.

B. 2" and smaller shall be bronze, OS&Y rising spindle, Underwriters approved, Jenkins 820, or similar by Nibco.

C. Valves shall be of the same manufacturer throughout.

2.06 DRAINS

A. All low points and pockets in the piping shall be provided with suitable means of draining.

B. Sprinkler branch lines shall be drained by installing 1/2" drain valves where required. Draw-off piping to draw-off sprinkler systems to be provided and run outside the building.

C. All drain connections and valves shall be in accordance with the standards of the National Fire Protection Association for the installation of the sprinkler systems.

2.07 HYDRAULIC BALANCE

A. The Contractor shall design sprinkler system as hydraulically balanced type with all necessary approvals incorporated as required. However, size of stand pipes must remain as sized on the drawings unless otherwise approved by the local Fire Department.

2.08 ALARM VALVES

A. Alarm check valve wet sprinkler system shall be approved vertical type, complete with excess pressure pump, water motor gong, drain valve, pressure gauges and other required trimmings, similar to Viking, Grinnell, Reliable or equal as approved.

2.09 FLOW SWITCHES

A. Water flow switches shall be Autocall Model No. 4160; Type WF-5, FM approved, UL listed, equipped with two (2) SPDT contacts, adjustable retard dial, cast aluminum saddle, flexible polyethylene paddle, rubber gasket and dust proof cover.

2.10 SUPERVISORY SWITCHES

A. Supervisory switches for OS&Y valves shall be Autocall Model No. OSYS-U, FM approved, UL listed, equipped with two (2) SPDT contacts, housed in a cast aluminum case with a red enameled finish tapped for a 1/2" NPT conduit connection.

2.11 DOUBLE CHECK BACKFLOW PREVENTER

A. Provide a Double Check Backflow Preventer having internally epoxy coated cast iron bodies and covers. The bodies shall be a "Y" pattern design incorporating two (2) spring loaded, center guided check assemblies with bronze seat rings and stainless steel springs. The device shall include flanged inlet and outlet full port OS&Y type shut off valves and four test cocks. All internal parts shall be of corrosion resistant materials. The Double Check Valves shall be constructed so all internal parts can be serviced without removing the device from the line. Seat discs shall be reversible. Double Check Valves shall be rated to 175 P.S.I. water working pressure and water temperature from 32° F to 140° F.

Furnish repair kit and a test kit with the unit.

2.12 ELECTRIC MOTOR DRIVEN FIRE PUMP

A. Furnish and install where shown on the plans, a fire pump system complete with pump, driver, controller and accessories as manufactured by Peerless, Inc. The pumping unit shall be listed by Underwriters' Laboratories, Inc. and shall be fully approved by the Associated Factory Mutual Fire Insurance Companies, where applicable. The pumping unit shall meet all requirements of the National Fire Protection Association Pamphlet No. 20. The fire pump shall be designed to deliver 1000 GPM when operating at 90 PSIG TDH. The pump shall also deliver not less than 150% of rated capacity at a pressure not less than 65% of rated pressure. The shutoff pressure should not exceed 120% of the rated pressure. Suction pressure is 40 PSIG.

B. The fire pump shall be vertical base mounted, split case, bronze fitted, single stage, double suction centrifugal pump.

C. The driver shall be a 75 HP, open drip proof, ball bearing type, AC induction, squirrel cage motor wound for 208 volts, 3 phase, 60 hertz. The motor shall be of such capacity that 115% of the full load ampere rating shall not be exceeded at any condition of pump load of U.L. listed fire pump systems and 110% of full load for F.M. approved fire pump systems. Locked rotor current shall not exceed the values specified in NFPA Pamphlet No. 20.

D. Pump and motor shall be mounted on a common baseplate of steel with drip rim. Pump and motor shall be checked for alignment after the pump base has been installed and grouted in place.

E. Casings shall be of cast iron having a minimum tensile strength of 35,000 PSI. Bearing housing supports and suction and discharge flanges shall be integrally cast with lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges.

F. Impellers shall be of the enclosed type and shall be of vacuum cast bronze. Impellers shall be dynamically balanced, keyed to the shaft, and held in place with threaded shaft sleeves.

G. The pump shaft shall be made of SAE 1045 steel or equal, accurately machined to give a true running rotating element. Shaft shall be protected by bronze sleeves which are key locked and threaded so that the sleeves tighten with rotation of the shaft. A gasket shall seal between the impeller hub and the shaft sleeve to protect the pump shaft.

H. Pump shall be equipped with renewable bronze casing rings so designed that hydraulic pressure will seat them against a shoulder in the pump case around the full periphery of the wearing ring. The wearing rings will be locked by dowelling to prevent rotation. The rotating element uses heavy duty grease lubricated ball bearings and shall be equipped with water slingers. Bearing housings shall be so designed to flush lubricant through the bearing.

I. All pumps where the suction pressure is expected to average 40 psi or below, shall be provided with a lantern ring connected to the pressure side of the pump by a cored passage in the parting flange of the pump. Stuffing boxes shall be equipped with split bronze packing glands designed for easy removal for packing, inspection, and maintenance.

J. The fire pump unit shall include the following accessories as required by NFPA standards:

1. A 6" x 8" concentric tapered discharge increaser.
2. A 10" (6 Conn.) hose valve header.
3. Pressure gauges.
4. A 3/4" circulation relief valve.
5. A 1/2" automatic air release valve.
6. A splash shield.

7. A 1/2" ball drip valve.

8. A coupling guard.

9. Six 2 1/2" hose valves.

10. Caps and chains.

K. The fire pump motor control shall be a Firetrol Model No. and shall be U.L. listed and F.M. approved, floor mounted. It shall be completely assembled, wired and tested by the control manufacturer before shipment from the factory and shall be labeled "Fire Pump Controller". The controller shall be located as close as practicable and within sight of the motor. The controller shall be located or protected that it will not be injured by water escaping from the pump or connections. The controller shall be of the combined manual and automatic, closed transition Wye-Delta type and be complete with:

1. Disconnect Switch - Externally operable; quick break type.

2. Circuit Breaker - Time delay type with trips in all phases set for 300% of the motor full load current.

3. Motor Starter - Wye-Delta, closed transition type capable of being energized automatically through the pressure switch or manually by means of an externally operable handle.

4. Running Period Timer - If controller set up for automatic shutdown after starting causes have returned to normal, a running timer set for at least one minute running time for each 10 horsepower, of motor rating (but which need not exceed seven minutes) shall be used.

5. Pilot Lamp - To indicate circuit breaker closed and power available.

6. A meter test link and voltmeter test studs.

7. Alarm Relay - To energize an audible or visual alarm through independent source of power to indicate circuit breaker open or power failure.

8. FM approved pressure recorder.

9. Manual Selection Station – A two position station shall be provided on the enclosure marked "Automatic" and "Nonautomatic".

10. Means shall be provided on the controller to operate an alarm signal continuously while pump is running.

11. Automatic Transfer Switch – By Electrical Subcontractor.

L. Furnish jockey pump having a capacity of 5 1/2 GPM at 240 TDH. Pump shall be double suction, regenerative type pump with cast iron casing, integral relief valve, a bronze impeller, stainless steel shaft and mechanically sealed stuffing box.

M. Pumps shall be driven by 1 HP, 3 phase, 60 hertz, 208 volt, open drip proof motor. For control of pump, furnish an adjustable pressure switch, air circuit breaker, a magnetic across-the-line starter, a selector switch, and a minimum run period timer, all in a single NEMA 1 enclosure.

N. The pump, driver, controller and all accessories shall be purchased under a unit contract. The pump shall be given a complete performance test with positive pressure. Certified performance curve shall be prepared and submitted. Pumps shall also be hydrostatically tested to twice the shutoff pressure, but in no case less than 250 lbs. per square inch. All such tests shall be conducted prior to shipment.

O. Contractor shall furnish an alarm panel for mounting at location of constant attendance. The alarm panel shall operate on 115 volt, 60 hertz power for supervisory voltage. Panel shall be furnished with visual audible, pump power failure, and pump running supervisory power failure alarm signals. Panel shall be located adjacent to fire alarm panel at main desk. Wiring between this panel and fire control panel shall be by the Electrical Contractor.

P. Performance curves for pumps shall be submitted with pump shop drawings. No shop drawings of fire pump shall be considered without curve data accompanying and individually designated.

Q. The manufacturer shall provide the services of a factory trained representative to align coupling and be available to assist in the final acceptance test. Coordination of final acceptance test with Underwriting Authorities shall be made by the installing contractor.

2.13 PRESSURE SWITCHES

A. Pressure switches shall be autocall, Model No. 4181-022, UL listed, FM approved, equpped with two (2) SPDT contacts, housed in an aluminum case, a brass bellows sensing element, nickel plated brass bellows housing with 1/2 inch NPT male pipe thread. Switches shall be factory set to transfer between 4 psi to 8 psi and shall be adjustable from 2 psi to 20 psi.

B. Entire installation must conform to NFPA 31.

2.14 FIRE DEPARTMENT SIAMESE CONNECTION

A. Fire Department Siamese Connection shall be similar to Potter Roemer Series 5020 cast brass two-way inlet body with drop clappers, 2 1/2 x 2 1/2 - 4 inch.

Polished brass plate lettered.

Two polished brass double female snoots with rigid end NPT x pin lug hose thread swivels, plugs and chain. Threads shall match local Fire Department requirements.

2.15 ROOF MANIFOLD

A. Roof manifold shall be of size and type as shown on Drawings. Manifold shall be cast brass body with 2 1/2" cast brass straight globe valves with wheel handles. Body shall be Poetter-Roemer 5870 Series; valves shall be No. 4115 or approved equal. This is a must for hi-rise. Also, see if architect has provided a hatch to the roof. Shut-off with tamper switch shall be located in heated area, convinient for use.

PART 3: EXECUTION

3.01 GENERAL

A. This Subcontractor, under this Section of Specifications, shall be responsible for the supervision of his personnel and the inspection of equipment and appliances provided by him to assure a safe working environment in compliance with OSHA regulations. In addition, this Subcontractor shall immediately report to the General Contractor, in writing, any possible violation of said O.S.H.A. regulations observed in areas occupied by his personnel. Failure to notify the General Contractor shall constitute this Contractor's acceptance of the working conditions and the responsibility therefore.

3.02 INSTALLATION

A. Refer to Architectural, Structural, Civil and Mechanical drawings for the location of all roof drains, ventilation ducts, electrical equipment, etc., in relation to all ceilings and other work. All piping shall be installed to conform to the ceiling treatment as shown on architectural drawings and shall be clear of all equipment as required by architectural treatment. Locations shown on the plans must be checked with the building conditions before starting work. Where ceilings are installed, all sprinkler piping shall be concealed above ceilings and pendent heads provided.

B. Reference to the architectural, general and detail plans and structural plans shall be made, which clearly indicate the type of building construction in which the sprinkler work shall be installed.

C. This Subcontractor shall prepare shop drawings showing locations and sizes of piping. These shop drawings shall be coordinated with the requirements of other trades and then submitted to the Architect and Insuring Agency for approval of general arrangement and strength of construction.

3.03 REGULATIONS

A. While materials and installation shall conform to the rules and regulations of the governing bodies, the Specification outlined in this Section shall be followed where they are in excess of the minimum requirements of the Underwriters recommendations or any local authority.

3.04 DESIGN CRITERIA

A. Sprinklers shall be hydraulically designed to provide 0.10 gpm/sq. ft. over most remote 2,000 sq. ft., plus 500 gpm for hose stream.

B. Secure water flow test data taken from hydrants nearest site. If recent flow test data is not available from city records, make necessary tests as required by NFPA standards to determine character of water supply.

C. Sprinklers shall be provided in all areas except electric closets, elevator machine room, and electric rooms.

D. Minimum operating pressure for any sprinkler shall not be less than 7 psi; maximum discharge pressure used at starting point shall not exceed 60 psi.

E. To allow for flexibility to accommodate remodeling and changes, calculated sprinkler systems shall be designed for no more than 90% of water supply curve.

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PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. The drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply the work of this Section.

1.02 SCOPE OF WORK

A. The work covered by this Section of the Specifications consists of furnishing all plant, labor, equipment Appliance and materials, and in performing all operations in connection with the HVAC systems, complete in strict accordance with this Section of the specifications and plans, and subject to the terms and conditions of the Contract.

B. The Contract Drawings indicate the extent and general arrangement of the systems. If any departure from and the Contract Drawings are deemed necessary by the Subcontractor, details of such departures, and the reason therefore, shall be submitted as soon as practicable to the Architect for approval. No such departures shall be made without the prior written approval of the Architect.

C. Installation, of the systems shall conform to requirements of the National Fire Protection Association, Life Safety, Public Safety, local codes and other agencies having jurisdiction.

D. It is not intended that the drawings shall show every pipe, fitting, or appliance, but this Subcontractor shall be required to furnish without additional expense, all material and labor necessary to complete the systems in accordance, with the best standard practice of the trade.

E. The equipment shall be installed in accordance with the recommendations of manufacturer and the best standard practice for this type of work.

F. Installation Directions: Obtain manufacturer’s printed operating and maintenance instructions for all major pieces of equipment.

1.02 SCOPE OF WORK (Continued)

G. Operation Instructions: Furnish manufacturer's printed operating and maintenance instructions for all major pieces of equipment.

H. Objectionable Noise and Vibrations: Mechanical and electrical equipment shall operate without objectionable noise and vibration, as determined by the Architect.

I. Equipment, Design and Installation:

1. Uniformity: Unless otherwise specified equipment or material of same type of classification, used for same purpose, shall be the product of the same manufacturer.

2. Design: Equipment and accessories not specifically described or identified by the manufacturer's catalog numbers shall be designed in conformity with ASME, IEEE, or other applicable technical standards, for suitable maximum working pressure and shall have neat and finished appearance.

3. Installation: Erect equipment in neat and workman like manner; operation; install so that connecting and disconnecting of ducts and accessories can be made readily and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation for indicated arrangements may be made as approved.

J. Protection of Equipment & Materials: Responsibility for care and protection all of materials and mechanical work rests with this Subcontractor at all times until it has been made as approved.

K. Machinery Drive:

1. Belt Drive: Where V-Belt drive is employed, design for overload as per manufacturer's recommendation for type of service intended, but in any case not less than 125% of motor H.P. rating, of dimensions, and number of belt to transmit required power with 95% minimum efficiency.

1.02 SCOPE OF WORK (Continued)

2. Belt Guards: Provide guards to enclose belt, pulleys, sheaves on belt-driven equipment. Construct of galvanized expanded or perforated sheet steel or 1" mesh wire screen inlet frame with steel angle channel mounting supports; make guard easily removable for access to belt, pulley or sheave. Conform to codes or regulation of agencies having jurisdiction. Paint prime and finish coats as directed.

L. Where hung ceilings are provided, all ductwork is to be concealed.

M. Foundations:

1. Floor Stands: Where equipment is indicated or specified to be floor mounted on stands or legs, constructed of structural, steel members or steel pipe and fittings; brace and fasten with flanges bolted to floor.

2. Ceilings or Wall Mountings: Where ceiling or wall mounting is indicated or specified, use suspended platform or strap hangers, bracket, or shelf, whichever is most suitable for equipment and its location. Construct of structural steel members, steel plates, rods, as required; brace and fasten to building structures or to inserts as approved.

1.03 FEES, PERMITS AND LICENSES

A. This Subcontractor shall apply and pay for all inspection permits, certificates of inspection and license fees in connection with this work, and shall deliver same to Owner at the completion of the work.

1.04 CODES AND REGULATIONS

A. All materials, equipment, work and installation shall be in accordance with the applicable requirements of the American Society of Heating, Refrigeration and Air Conditioning Engineers; National Fire Protection Association; American Society of Testing Materials; American Society of Mechanical Engineers; National Electric Manufacturer's Association and any pertinent federal, state and local codes, laws and ordinances, which

1.04 CODES AND REGULATIONS (Continued)

requirements have precedence over the specifications in the event of any conflicts. Any conflicts between items of the above requirements or with the specifications shall be referred to the Architect.

1.05 SUBSTITUTIONS

A. Where a particular product or material is specified by name, it shall be considered as a standard and as the most satisfactory for its particular purpose in the building. Another product or material equal in all respects may be submitted for consideration as a substitute under the following conditions:

1. No substitutions shall be used unless approved in writing by the Architect.

2. This Subcontractor shall submit shop drawings for approval before ordering equipment. The Architect reserves a right to disapprove any substitutions without qualification if, in his opinion, the equipment offered does not equal the equipment specified.

3. Acceptance of substitution by the Architect shall not relieve the Subcontractor from responsibility if the substituted equipment does not perform as per the original specifications.

B. Any change in cost of other items in all other trades as well as under this section shall be borne by this Subcontractor if the changes are a result, directly or indirectly, of a Subcontractor proposed substitution. All drawing changes shall be provided by this Subcontractor.

1.06 SUBMITTALS

A. General
Submit the following in accordance with the Gneral Conditions and Division 1 specification section.

1. Within thirty days of award of Contract, this Subcontractor shall submit to the Architect for approval, seven (7) copies of a complete list of all materials and equipment to be furnished under this section of the specifications and the name of the manufacturer for each item. No partial submittal shall be approved.

1.06 SUBMITTALS (Continued)

2. After approval of the above list, this Subcontractor shall submit to the Architect for approval, seven (7) complete sets of Manufacturer's bulletins and shop drawings of all material and equipment to be furnished under this section of the specifications. No fabrication of equipment for this project shall be started until the shop drawings have been approved.

3. This Subcontractor shall assume the entire cost of responsibility for any changes in the work which may be occasioned by use for material or equipment other than those specified.

4. Operation maintenance manuals shall be also submitted as noted herein.

5. A 1/4" scale drawing coordinating and indicating all trades of the Upper Penthouse Mechanical Room.

1.07 INTENT

A. The entire work provided in this Specification shall be constructed and finished in every respect in workmanlike and substantial manner, according to the accompanying drawings and this Specification.

B. It is not intended that the drawings shall show every pipe, fitting, and appliance, but this Subcontractor shall furnish and install such parts as may be necessary to complete the system in accordance with the best practice of this trade and to the satisfaction of the Architect.

C. This Subcontractor shall provide all necessary tools, machinery and transportation for the completion of his work.

D. All refuse, waste or broken material in connection with this section shall be removed from the premises by this Subcontractor.

1.08 PLANS AND SPECIFICATIONS

A. The Plans and Specifications are complimentary each to the other, and any labor or material called for by either, whether or not by both, or necessary for the successful operation of any components shall be furnished and installed.

1.08 PLANS AND SPECIFICATIONS (Continued)

B. This Subcontractor, before installing any of his work, shall see that it does not interfere with the clearances required for other work. Installed work which interferes with the Architectural design shall be modified as directed by the Architect, and all costs incidental to such changes shall be borne by this Subcontractor.

C. This Subcontractor shall make himself familiar with the plans and specifications for all other trades to prevent interferences and assure complete coordination.

1. Where a conflict exists between drawings of various trades seek clarification from the architect for locations and requirements.
2. In the case of such conflict, the greater requirements for material and labor shall be provided.

1.09 GIVING INFORMATION

A. This Subcontractor shall keep himself fully informed as to the shape, size and position of all openings and foundations required for this apparatus and shall give full information to the Owner's superintendent sufficiently in advance of the work, so that all such openings and foundations may be built in advance. He shall also furnish all sleeves and supports herein specified, so the General Contractor may build same in place.

1.10 OBTAINING INFORMATION

A. This Subcontractor shall obtain detailed information from the manufacturers of apparatus which he is to provide for the proper methods of installation. He shall obtain all information from the General Contractor and other Subcontractors to insure full comprehension of the work to be done and to assure coordination between work under this Section and all other work under this Contract.

1.11 PIPE IDENTIFICATION AND VALVE TAGS

A. This contractor shall furnish and install color coded pipe identification markers on all piping. In general, for diameters 3/4" through 5 7/8", marker shall be type set mark. All markers shall be snap-in-place type, SET MARK, as manufactured by Seton or approved.

1.11 PIPE IDENTIFICATION AND VALVE TAGS (Continued)

B. Provide an arrow marker with each pipe content marked to indicate the direction of flow.

C. Piping shall be labelled at each valve, straight runs of piping at intervals not greater than 10 feet, and at exit and entrance points to each piece of equipment.

D. All markers shall be OSHA approved.

E. All valves on pipes shall have neat circular (brass) background with black letter number showing through tags of at least 2" in diameter, attached with a brass hook to each valve stem.

F. These number valves shall be on two printed detailed lists. These printed lists shall state the numbers and locations of each valve and control, and the section, fixture or equipment which it controls, and other necessary information such as requiring the opening or closing of another valve when one valve is to be opened or closed.

1.12 CLEANING

A. The work areas, including any storage areas, shall be kept free from accumulation of waste materials, dirt, or rubbish. At the completion of the work, this Subcontractor shall remove all dirt and debris caused by this work at the site, and shall remove from the premises all his tools, scaffolding, equipment, crating and shipping containers and materials belonging to him, leaving the premises, so far as his work is concerned, broom cleaned in a condition satisfactory to the Architect.

1.13 EXAMINATION OF SITE

A. This Subcontractor shall visit the site and fully familiarize himself with conditions to be encountered in the performance of the work. Failure to do so shall not relieve this Subcontractor of responsibility for full completion of the work in accordance with the drawings and specifications.

1.14 PERFORMANCE TESTS

A. Upon completion of the work, and after all systems are set and balanced, this Subcontractor shall conduct performance tests of all systems. These tests shall be carried out in the presence of the Architect prior to acceptance of the systems and shall be arranged for the purpose of demonstrating satisfactory functional and operating efficiency as well as adjustment. During this period, the setting of all automatic controls shall be checked to insure that conditions are correct, and that capacities are adequate to meet the specified requirements. This Subcontractor shall provide a competent engineer to conduct all tests in the presence of the Architect. The general operating tests shall be performed under as near design conditions as possible for a period of not less than eight hours for each system, and shall demonstrate that all equipment is functioning in accordance with the specifications City of Boston, Fire Department, and state requirements. This Subcontractor shall furnish all instruments, ladders, lubricants, test equipment and personnel required for the tests.

1.15 OPERATION & MAINTENANCE INSTRUCTIONS

A. Printed instructions covering the operation and maintenance of each major item of equipment shall be posted at locations designated by the Architect. Upon completion of the work, and after all tests are completed and the system set, at a time designated by Architect, this Subcontractor shall instruct a representative of the Owner for eight hours in the proper operation and maintenance of the systems. Both verbal and written instructions shall be furnished in detail. Written sets shall make reference to each item and describe its proper functioning, adjustment and maintenance. Four copies shall be furnished, bound in a form suitable for filing.

1.16 GUARANTEES

A. All parts of the installation are to be guaranteed in writing by this Subcontractor to be free from defects and/or manufacture and installation for a period of one year from the date of written acceptance of the entire building by the Architect. This Subcontractor shall replace without charge to the Owner, any part or parts of piping and equipment, and all labor and materials required, which fails due to such cause or causes during the guarantee period.

1.16 GUARANTEES (Continued)

B. The above guarantees shall be in addition to, not a limitation of other rights the Owner may have under the General Conditions.

C. This Subcontractor and the manufacturer supplying each unit of equipment shall guarantee same to be of a capacity and capable of performance as represented by the manufacturer.

D. The manufacturer's written guarantee, where such guarantee extends beyond the one year limit stated herein, shall be delivered to the Architect for transmittal to the Owner.

1.17 RECORD DRAWINGS

A. In accordance with the requirements of Section 01700 Project Closeout, furnish and keep on the job at all times, one complete and separate set of blackline prints of the HVAC work on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all architectural and HVAC changes, revisions and additions to the work. Wherever work is installed than as otherwise shown on the Contract Drawings, such changes shall be noted.

B. Indicate daily progress on these prints by coloring in the various pipes, valves, apparatus, and associated appurtenances as they are erected.

C. No approval of requisition for payment for work installed will be given unless supported by record prints as required above.

D. At the completion of work, prepare record drawings in accordance with the requirements of the Section.

1.18 WORK EXCLUDED

A. Cutting and patching.

B. Painting.

C. Excavation and backfilling.

D. Electrical power wiring.

1.18 WORK EXCLUDED (Continued)

E. If the required height of staging, planking and scaffolding exceeds eight (8) feet, the entire staging, planking and scaffolding will be furnished, installed and maintained at no cost to this Subcontractor.

1.19 WORK INCLUDED

A. The work included shall generally consist of, but not be limited to, the following:

1. Furnishing and installation of toilet exhaust systems, and curbs.
2. Furnishing and installation of hot water system, including gas-fired modular hot water boilers, heating coils, unit heaters, radiation, pumps, and all controls.
3. Furnishing and installation of air conditioning systems as indicated, including vertical fan coil units, roof mounted liquid chiller, pumps, roof curbs and controls.
4. Staging, planking and scaffolding less than eight (8) feet in height.
5. Stairwell pressurization, smoke vestibule pressurization, and corridor HVAC smoke exhaust systems.
6. Furnishing and installation of dryer sheet-metal and roof vents.
7. Furnishing and installation boiler breaching, sheet-metal, pipe, duct and breaching insulation
8. Furnishing and installation of fire dampers, combination fire and smoke dampers and volume dampers.
9. Furnishing and installation of Automatic Temperature control systems, motor starters, disconnect switches, and heat tracing.
10. Furnishing and installation of piping, valves, air separator expansion, tank, vents and sleeves.
11. Furnishing and installation of hangers, supports and miscellaneous steel.

1.20 WORK NOT INCLUDED

Covers in Section 10200.

Cutting and patching.

Housekeeping pads.

Excavation, backfill and trenching.

Flashing and fire proofing of all pipe and duct penetration in Section 07270.

Electrical power wiring, starters and disconnect switches where not provided by this section, wiring of smoke detectors to fire alarm system.

Installation of access panels furnish under this section shall be by the trades as designated by the General Contractor.

Plumbing work.

PART 2: PRODUCTS

2.01 PIPING SYSTEMS

A. Hot water and chiller water supply and Return Piping, Relief Valves, Equipment Vent and Drain:

Piping:	Schedule 40 carbon steel conforming to ASTM A53, Grade A or type "L" copper.
Fittings:	
2" and smaller	Screwed, cast iron, 125 lb. ASA standard Cast or wrought copper fittings.
2 1/2" and larger	Butt welded, wrought carbon steel conforming to ASA A234, Gr. WPA and ASA B16.9. Schedule or wall thickness not less than adjacent pipe.

B. Makeup Water Piping:

Piping:	Type "L" hard drawn copper tubing conforming to ASTM B88.
Fittings:	Solder joint, cast brass conforming to MB88.
Solder:	95-5 hard, lead free

C. All Piping Systems:

Unions:	
2" and smaller	Screwed, 300 lb. nonshock, cold WOG, malleable iron, brass to brass at, ASTM A105 Gr. 2, as manufactured by Walworth or Crane.
2 1/2" and larger	Use flanges and gaskets as specified below.

2.01 PIPING (Continued)

Flanges:

2 1/2" and larger	150 lb. ASA Standard welding neck, A181, Gr. 1 and ASA B16.5 installed with carbon steel nuts and bolts proper gaskets for the service.

Joints:

2" and smaller	Screwed joints shall be made up with "Copalite."
2 1/2" and larger	Welded.

D. Valves:

Gate:

2" and smaller	125 lb. WSP, all bronze rising stem, screwed bonnet, solid wedge, designed to permit repacking under pressure, threaded ends.
2 1/2" and larger	125 lb. WSP, flanged iron body, bronze mounted, O.S.&Y. rising stem, solid wedge, designed to permit repacking under pressure.

Check:

2" and smaller	125 lb. WSP, all bronze, horizontal swing type, screwed caps, bronze disc designed to allow regrinding of seal without removal of valve body, bronze disc or bronze faced disc.
2 1/2" and larger	125 lb. WSP, flanged iron body, horizontal swing type.
All Sizes	In vertical, use nonslam type only.

2.01 PIPING (Continued)

Globe And Angle:

2" and smaller	125 lb. WSP, all bronze rising stem, union bonnet, renewable composition disc designed to permit repacking under pressure, solder or threaded ends as applicable.
2 1/2" and larger	125 lb. WSP flanged iron body, bronze mounted, O.S.&Y. rising stem, renewable disc, designed to permit repacking under pressure.

Ball valves 2" and smaller may be used in lieu of gates.

E. Combination Balancing And Shutoff Valves:

Combination balancing and shutoff valves shall be of ball valve design. Levers shall be covered with a vinyl grip, attached by a nut. Stem gland shall be adjustable, independent of lever, to compensate for wear. Stuffing box seals and ball seats shall be composed of glass reinforced Teflon. Bronze solder (or threaded) end valves shall rate at 400 psi, WOG, with hard chromium plated bronze balls. Positive 100% shutoff valves shall have balancing stop to guarantee that valve returns to prebalanced position. Port size for 3/4" ball valves shall not be less than 11/16". All valves shall have been factory tested 100 psi air under water. Valves shall be "Apollo" brand as manufactured by Consolidated Brass, Sarco or Watts.

F. Air Removal Fittings: Tank and boiler fittings of the sizes indicated for hot water system shall be "Airtrol" as manufactured by Bell and Gossett Co., Taco or American Tube Products.

G. Automatic Air Vent Valves: Automatic air vent valves shall be Sarco No.13W with 3/4" inlet or equal, except for fin tube piping, which shall be Bell and Goddett No. 17SR, Taco, Thrush or American Tube Products.

2.01 PIPING (Continued)

H. Strainers shall be installed as indicated on the drawings and shall be as manufactured by Sarco Co., Inc. Strainers 3" and smaller shall be Standard "Y" type AT. Strainers 4" and larger shall be type "D" Standard, 150 lb. WSP. All strainers shall be designed for not less then 125lb. working pressure and shall contain blow off valves. Strainer baskets shall be Monel. Strainers similar to above may be as manufactured by Hoffman Specialty Mfg. or Illinois or equal.

I. Pressure gauges shall be No. 800 Trerice Co., or similar as manufactured by U.S. Gauge or Taylor, with 4 1/2" diameter dial. Gauges on the hot water system shall have a range of 0 to 100 psi. Each gauge shall be provided with a shutoff gauge cock. Gauges shall be installed at each pump suction and discharge and elsewhere as indicated.

J. Thermometers shall be installed as indicated on the drawings and in such a position that they indicate accurately the temperature surrounding the thermostat element. Thermometers shall be Taylor Instrument Company Industrial Type, complete with 9" scale, perma-color liquid, union hub and separable wells. Extension neck wells shall be used on insulated piping and equipment. Equivalent thermometer by Trerice shall be acceptable. Thermometers shall have a range of 30° to 240° F on hot water system with 2° F 0 scale division.

K. Pipe Hangers:

1. All piping systems shall be supported by means of hangers having an individual means of vertical adjustment for leveling of lines after piping is in place and shall be fabricated in accordance with Section 6 of the American Standards Association for Pressure Piping.

2. Pipe Hangers, supports, hanger rods, and inserts shall be Witch Products as manufactured by Carpenter & Patterson, Inc., Calco or Grinnell.

3. The pipe suspension shall be such as to prevent excessive stress, excessive vibration in supporting force, and possible resonance with imposed vibration while the system is in operation.

2.01 PIPING (Continued)

4. Hangers to be of the adjustable type and provided with a suitable connection for the hanger rod such as swivel nut integral with hanger, hanger adjuster or hole provided in the hanger for threaded rod with nut.

5. At all pipe connections to equipment, provide suitable supports to prevent transmission of the pipe weight to the equipment connection.

6. Hangers and supports shall be spaced to prevent sagging of the pipe and to permit proper drainage of the pipe line. Maximum spacing of hangers or supports shall be as follows:

Pipe Size (Inches)	Spacing
1/2 to 1	7 feet
1 1/4 to 3	10 feet
4 to 6	14 feet

7. Hangers or supports shall be placed within 1 foot of each horizontal elbow. Vertical runs of pipe not over 12" from the elbow on the connecting horizontal runs.

8. Hangers, guides and saddles, when used with copper piping, shall be of a nature to prevent galvanic or electrolytic reaction.

9. All hangers on insulated lines shall be sized to fit the outside diameter of the pipe insulation. Provide pipe covering protection saddles at all hangers on insulated lines. Provide sixteen (16) gauge sheet metal shields, 12" long and covering 180° of arc on the covering at all hangers on insulated lines. Piping shall not be supported from the metal decking.

L. Anchors:

1. Provide anchors for controlling direction and extent of pipe expansions at locations as required or indicated in the various piping layouts.

2. Anchors shall be Witch Products as manufactured by Carpenter & Patterson, Inc., Calco or Grinnell.

2.01 PIPING (Continued)

3. Anchors shall be installed to permit the piping to take up its expansion and contraction freely in opposite directions away from the anchored point and shall be so designed for the particular location and acting conditions.

4. For all piping connections to equipment, provide anchors to support the piping in such a manner as to prevent transmission of piping strains to equipment connections.

M. Pipe Sleeves And Escutcheons:

1. All exposed horizontal and vertical pipes passing through floors or walls must be provided with #20 gauge sleeves and floor plates and where ceiling is finished with ceiling plates. All plates must be securely fastened to the pipe or to the sleeve. Plates shall be chromium plated.

2. Annular space between sleeves and pipe and/or pipe insulation fire stopping shall be as specified in Section 07270.

N. Alignment Guides:

1. Provide pipe alignment guides where indicated, required or described to guide the expanding pipe to move freely from anchor points to loops or bends.

2.02 SHEET METAL DUCTWORK

A. General: Sheet metal work shall be fabricated and installed in accordance with applicable requirements of the SMACNA and in accordance with NFPA-90A. All ductwork shall be neat, accurate, rigidly constructed and mechanically tight as well as substantially airtight. Offsets of exposed ductwork shall be made on sides opposite to walls or ceilings unless otherwise shown on the drawings or specified.

B. Materials: Ductwork shall be of aluminum or galvanized sheet metal. Galvanized sheet metal shall be new copper bearing (or prime grade) galvanized steel sheets of lock forming quality. Zinc coating that will flake or peel under any forming operations or laminated sheet will not be allowed.

2.02 SHEET METAL DUCTWORK (Continued)

Aluminum sheets shall be mill finish (3003-H14). All joints between junction points between aluminum and steel or iron shall be painted with zinc chromate to prevent electrolytic action.

1. Thickness of metal for rectangular ducts, including elbows and other details, shall be as follows:

Longest Rectangular Dimension of duct Inches	Thickness Aluminum-B&S Gauge	Thickness Galv. Steel -USS Gauge
13 to 30	24	26
13 to 30	22	24
31 to 54	20	22
55 to 84	18	20

Duct Diameter Inches	Aluminum B&S Gauge	Galv. Steel USS Gauge
Up to 10	22	24
11 to 20	20	22
1 to 40	18	20

C. Construction:

1. Longitudinal Seams: Longitudinal joints in ducts not exceeding 60 inches in either dimension, and ducts exceeding 60 inches in the larger dimension, shall be either Pittsburgh lock seams or groove seams.

2. Transverse Joints And Bracing Angles: The down stream end of each section of round ducts shall be crimped and beaded. Assembly shall be made by inserting the crimped end into the upstream end of the adjoining section. The joints shall be fastened in place by three or more sheet metal screws spaced not over 8" apart.

D. Change in Duct Direction: Long radius elbows shall be provided, except as indicated hereinafter.

1. Long Radius Elbows: Long radius elbows shall be constructed a throat radius equal to not less than the dimensions of the duct width in plane of turn. Where space does not permit the use of long radius elbows, vaned mitered elbows shall be provided.

2.02 SHEET METAL DUCTWORK (Continued)

E. Dryer vents shall be fabricated with pop-rivets or other fastening devices. Sheet metal screws protruding into the duct system will not be allowed.

F. Splitter Dampers: Shall be installed in ducts where shown on the drawings, in each branch duct, and where required to permit complete adjustment of air quantities at all outlets. Splitters shall be two gauges heavier than the duct.

G. Volume Dampers: Shall be of multiple opposed blade type. Multiple blades shall not be over 12" wide, and shall be gang operated. The square end of each damper rod shall be held in lever and quadrant with locking device.

H. All transverse joints in all duct systems shall be made airtight with a duct joint compound, EC-800 or equal.

I. Fire Dampers: Shall be located and installed where indicated on the drawings in accordance with the standards of the National Fire Protection Association No. 90-A and applicable to local codes and ordinances. Damper frames shall be large enough so that there will be no obstructions to air flow when the dampers are open. Access doors shall be provided at each fire damper for replacement of links. Fire dampers shall bear U.L. labels and be 1/2 hour rated. Installation diagrams shall be provided with submittal.

J. Access Doors: Duct access doors shall be provided at volume splitters and fire dampers in locations and sizes which will afford easy access to the dampers, filters and all other equipment requiring inspection and service in the duct system. Doors shall be as manufactured by Vent Fabrics, Inc., of approved dimension and as large as practicable, with frame, brass hinges, handle, clamping devices and felt gasket for airtight joint.

K. Apparatus Connections: Where sheet metal connections are made to fans, at building expansion joints, or where ducts of dissimilar metal are connected, a noncombustible flexible connection of 30 ounce neoprene fiberglass, a minimum of 6" in width, shall be used. Flexible connections shall be securely fastened by zinc coated iron clinch type draw bands.

2.02 SHEET METAL DUCTWORK (Continued)

L. Cleaning: Before the duct system is tested and balanced, the interior of all ducts shall be cleaned thoroughly by blowing through the system with the ventilating fan. Cheesecloth shall be secured over each air outlet to entrain dirt and dust during this operation.

M. Duct sleeves and flanges for walls and floors shall be fabricated from 22 gauge galvanized sheet steel, flanged against the wall on each side, and fastened to the sleeve. Sleeves shall be 2" larger than the duct, unless otherwise required by the thickness of the insulation. Framed openings shall be provided for ducts larger than 12" in diameter and for all square duct insulation, and the opening of sleeves shall be packed with commercial grade twisted rope and caulked airtight.

N. All supply and return air ductwork for AC units shall be lined with 1" thick, 1/2 lb. density, neoprene faced, semirigid fiberglass duct liner with neoprene coated face exposed to air stream. The duct dimensions indicated on the plans shall be increased accordingly to allow for the thickness of the duct liner. Ducts 24" in width or breadth shall have duct lining secured at top and sides with adhesive attached metal fasteners, staggered on 12" centers. All projecting ends of fasteners shall be cut off virtually flush. All exposed edges and joints are to be coated with vapor proof adhesive.

2.03 AUTOMATIC SMOKE AND FIRE DAMPERS

A. H&V Subcontractor shall furnish and install where shown on the plans, combination fire and smoke dampers constructed and tested in accordance with U.L. 555. Each damper shall possess a 1/2 hour fire protection rating and shall contain a U.L. label. The electric damper motor shall have sufficient torque characteristics to operate the size damper indicated.

1. Damper motors shall be furnished as an integral part of the damper by the manufacturer. Damper motors shall be spring return type that allow dampers to close on power interruption and shall require 120 volt A.C. power to open. Motors shall be completely installed and linked ready to operate the damper. Motors shall be installed inside of the replacement.

2.02 SHEET METAL DUCTWORK (Continued)

2. Dampers shall be combination fire and smoke dampers capable of being mechanically reset.

3. Units shall be signaled from a smoke detector. The smoke detector and related wiring shall be by the Electrical Contractor. The dampers and motor operator shall be furnished and installed by the H&V Contractor, wired by the Electrical Contractor.

4. Dampers shall be Prefco Products, Inc., Model No. 5030 or similar by Phillips or Ruskin.

5. Installation diagram shall be provided with submittal.

2.04 AIR OUTLETS

A. Air outlets shall be located where shown on the drawings and shall be designed and adjusted to diffuse the specified primary air quantities uniformly throughout the space. Air outlets including registers, grilles and pertinent accessories shall be as manufactured by Titus Mfg. Co., Tuttle and Bailey, Carnes, or Metal-Aire. Air outlets shall be as follows:

1. Return air registers and toilet exhaust registers shall be single deflection (40° angle) type with opposed blade volume damper and with off white baked enamel finish, with sizes as indicated on the drawings.

2. Supply air registers shall be double deflection type with opposed blade volume damper and off white baked enamel finish, sized as indicated on the drawings.

2.05 INSULATION

A. Covering for Makeup Cold Water, Hot Water and Chilled water Piping:

1. Hot and chilled water supply and return piping shall be insulated with fiberglass of 4 lb. density. Insulation shall be complete with factory applied, all purpose jacket. Insulation for piping for 4" and smaller shall be 1 1/2" thickness. Runouts up to 12′ shall be 1/2" thick.

2.05 INSULATION (Continued)

2. Cold water makeup shall be 1/2" fiberglass with vapor barrier jacket.

   a. Longitudinal and end joints of the jacketing shall be pasted smoothly over the insulation of fireproof adhesive.

   b. Fittings, flanges and valves for pipe sizes 4" and smaller shall be insulated with J-M #301 cement a thickness equal to the adjoining pipe insulation. Fittings, flanges and valves for pipe sizes 5" and larger shall be insulated with segments of the molded insulation securely wired in place. All fitting insulation shall be finished with smoothing coat of J-M #352 cement. All cement shall be vapor proof. In lieu of vapor jackets, Zeston fittings with vapor proof inserts may be used.

   c. When in contact with the cold pipes, clamp hangers, pipe anchors, etc., shall be insulated and vapor sealed as specified above.

   d. Under no circumstances shall stapling of the insulation and jackets be permitted.

   e. Insulated piping above roof shall be completely waterproofed.

   f. Insulation shall be omitted on the following fittings and piping:

      1. Screwed unions and exposed connections to units.

      2. Vents to atmosphere, overflow and drain pipes, except air conditioning drains.

B. Insulate AC drain piping with 1" Armaflex 25/50 rated flexible, closed cell elastomeric insulation, or equal. Seal all joints with adhesive and tape as recommended by the manufacturer. When exposed to weather, protect with WB Armaflex finish or approved equal.

C. All insulation shall be neatly terminated where insulation is omitted, with insulating cement trawled on a bevel. The cement and finish shall be the same as specified for fittings and valves.

2.05 INSULATION (Continued)

D. Insulation for breaching and steel chimney shall be 1 1/2" thick, high temperature, (500o) fiberglass, or 1" thick calcium silicate. All joints insulation shall be pointed with high temperature cement, and all insulation shall then be covered with fiberglass jacket adhered with high temperature adhesive.

E. Covering shall be neatly finished and pipe hangers, pipe anchors, and pipe covering protection saddles as specified for fittings, flanges and valves.

F. All insulation herein specified shall have a maximum flame spread of 25 and a maximum smoke developed of 50, shall be in strict accordance with U.L. recommendations. The Contractor shall verify all insulation prior to submitting shop drawings.

G. Ductwork above the roof shall be insulated with 2" thick, 3 lb. density fiberglass with vapor barrier jacket exposed. Insulation shall then be wrapped with glass fabric cloth set in two coats weatherproof mastic to a thickness of 1/8" minimum.

H. All ductwork shall be insulated with 1 1/2" thick, 1 1/2 pound density blanket with vapor barrier jacket unless ductwork is lined.

I. Ductwork Insulation: All outside air intake ductwork shall be insulated with 1" thick, 3 lb. density fiberglass. All insulation shall be furnished with factory applied, non-asphaltic, fire resistant vapor proof jacket with vapor transmission rate of less than 0.55 perm. The jacket shall be adhered with flame retardant adhesive.

The aluminum surface shall be exposed. The insulation shall be considered noncombustible by F.M. and U.L.

1. All insulation shall be applied with edges lapped or tightly butted and secured by impaling on metal clips, adhered with adhesive to the duct. Clips shall be spaced not over 12" apart each way to hold insulation firmly against the duct surface. All joints and voids shall be

2.05 INSULATION (Continued)

pointed up and sealed with a fireproof emulsion and centered over the joints. The emulsion with Glasfab tape shall be applied over all anchor clips when they pierce the covering. The insulation covering shall be completely vapor sealed.

J. All supply and return ductwork exposed to weather shall be insulated as specified in "J." above. In addition, insulation thickness shall be increased to 2" and shall be further covered with a layer of 45 pound felt and then painted with a coat of bitumastic asphaltum. Pitch insulation as required to prevent standing water.

K. Chilled Water Pumps:

1. Chilled water pump housing shall be insulated with 1/2" thick, 3/4 lb. fiberglass insulation wrapped firmly under compression (minimum two-one) and held in place by spiral windings of twine. The insulation shall be vapor sealed with 3-ply white or black vapor barrier jacket, having vapor transmission rate of less than 0.2 perms. The insulation shall be applied over a clean, dry surface with end joints butted firmly together. The butted end joints shall be wrapped with 4" wide strip of vapor barrier jacketing. The insulation shall be securely applied and finished with vapor barrier jacket held in place with fireproof adhesive.

L. Heat Exchanger:

1. This equipment shall be insulated with 1 1/2" thick calcium silicate block or high temperature fiberglass secured with 1/" wire cables and 16 gauge annealed wire lacings on not over 9" centers. Where required, welded studs, clips or angles shall be provided as anchors for wires or bands. Joints shall be filled with cement. Over the insulation 1" galvanized hexagonal mesh wire shall be tightly stretched in place and secured by wiring to anchors with edges tied together. 1 1/2" cement plaster shall then be applied in two coats; one scratch coat and finish coat trawled to a smooth even finish.

2.06 EXPANSION TANKS

A. Each expansion tank for the hot and chilled water system shall be of size indicated on the drawings, of all copper bearing steel welded construction, designed, constructed and stamped in compliance with ASME Code and unfired Pressure Vessels for maximum working pressure of 125 psi, complete with gauge glass, air charging fitting, drain fitting, etc., suitable for ceiling suspension. Tank shall be as manufactured by Bell and Gossett Division of I.T.T., John Wood, Bernstrom, Taco or Thrush.

2.07 PUMPS

A. Pumps shall be base mounted, centrifugal type as indicated with flexible coupling connections of pump to motor, and coupling guard as manufactured by Bell and Gossett, Taco or Thrush. Pumps shall be complete with mechanical seals, standard bronze fittings, and 1750 RMP motors, magnetic starters with "Hand-Off-Auto" selector switches and pilot lights in covers. Pump capacities shall be as indicated on the drawings. All pumps shall be non-overloading at any point on pump curve.

2.08 BREACHING AND CHIMNEY FOR BOILER

A. Breaching and chimney sized as indicated on the drawings shall be #16 gage welded steel. Design shall be based on a flue gas temperature of 1000°F. All necessary stiffener angles, clean out doors, hangers and supports shall be included, and the installation shall be such as to eliminate soot pockets.

2.09 ROOF EXHAUST FANS (TOILET'S AND LAUNDRY'S)

A. Each roof exhaust fan shall be direct driven or belt driven type, all aluminum or fiberglass construction, complete with motors, bird screen, permanently lubricated ball bearings, air cooled motor compartments, airfoil blades, motor operated automatic control dampers, and disconnect switches in housing. Fan shall operate without objectionable noise or vibration and shall have AMCA certified rating seal and shall be as manufactured by Penn, Acme, or Cook. Roof exhaust fans shall be complete with 12" high, self-flashing curbs.

2.10 CEILING EXHAUST FANS

A. Each toilet exhaust fan shall be direct drive type, all aluminum or fiberglass construction, complete with motors and grille, with size as indicated on the Drawing. Fan shall have U.L. certified rating seal, back draft damper and shall be as manufactured by Nutone, Broan or Penn.

2.11 HYDRONIC UNIT HEATERS

A. Propeller type, arranged for horizontal discharge, complete with suitable efficient air deflectors, hot water coil, direct driven motor and guard. Unit shall be manufactured by Airtherm, Sterling or Trane with capacities and sizes as indicated on the drawings. Unit heaters shall be provided with disconnect switches, mounted on heater casing.

B. Hydronic Kickspace Heaters

  a. Hyudronis heaters shall be Beacon/Morris Company, designed for kickspace.

  b. Construction shall be of sheet metal with minimum of 20 gauge for the housing and 16 gauge for the front grille.

  c. The hot water coil shall be copper tube aluminum fin element with an electric motor and air vent on supply connection.

  d. Optional built in accessory thermostats shall be provided for kickspace applications, and two speed switch.

  e. Heaters shall be listed by Underwriter's Laboratories.

2.12 ELECTRIC WALL HEATERS

A. Electric wall heaters shall be of the fan type and utilize the "Down-Flo" principle of air circulation. They shall be designed for mounting as scheduled within standard 16" stud centers and wall thicknesses. They shall be ruggedly constructed of 20 gage (minimum) sheet metal.

B. The heating element shall be encased in an aluminum finned casting and protected by a thermal limit switch to prevent excessive temperature should normal air flow through the heater be blocked for any reason.

2.12 ELECTRIC WALL HEATERS (Continued

C. A fan delay switch shall be provided to delay operation of the fan until the heating element reaches a preset temperature.

D. The fan shall be precision balanced and the fan and motor assembly shall be mounted for vibration free performance. The fan motor shall be totally enclosed and self lubricating and a non-radio interfering type.

E. A precision hydraulic action thermostat shall be provided for positive temperature control when a two button switch is in the "ON" position.

F. A DPST manual switch shall be provided which disconnects all ungrounded conductors from the heater circuits when in the "OFF" position.

G. The heaters shall be listed by Underwriter's Laboratories, Inc.

H. A full louvered heavy duty 16 GA front grille shall be provided which conceals all controls and renders them tamper proof.

I. Additional wall boxes shall be available to allow semi-recess or surface mounting of heater.

2.13 MODULAR HOT WATER BOILER BURNER UNIT (GAS-FIRED)

A. Contractor shall furnish and install, where indicated, cast iron gas-fired modular hot water boiler, complete with one or more batteries of boiler modules, and all accessories in accordance with manufacturer's instructions and in compliance with all rules and regulations of authorities having jurisdiction.

B. Boiler shall be I-B-R approved and shall have capacity as indicated on the drawings.

C. Each boiler module shall be completely factory assembled. Each assembly shall include: Burner base, cast iron mixing tube, cast iron atmospheric raised port burner, cast iron absorption unit, cast iron flue collector, thermocouple type safety pilot, automatic gas valve and pressure regulator, as required for operation with natural gas.

2.13 MODULAR HOT WATER BOILER BURNER UNIT (Gas Fired) (Continued)

D. Controls for each boiler module shall be factory tested and shall be suitable for firing each module individually. Step firing of each battery shall be accomplished by firing individual boiler modules without reducing their thermal efficiency. Controls shall be arranged so that any one boiler module may be made inoperative and removed from the system without interfering with the normal operation of the other boiler modules.

E. For each boiler module, manufacturer shall supply high limit control and AGA approved vent connector. Vents shall be connected to a common breaching.

F. For each boiler module manufacturer shall supply ASME approved relief valves, tridicator and insulated steel jacket to enclose boiler modules.

G. Where indicated on the plans, a steel shell and copper tube heat exchanger shall be attached to indicated modules using connections supplied by the manufacturer. Heat exchangers shall be enclosed with an insulated steel jacket and shall have necessary pipe tapping for insertion of thermostatic controls.

Heat exchangers shall be as manufactured by Hydrotherm, Inc. and shall have a combined hourly recovery capacity through a 100° F temperature rise with 200° boiler water.

H. Manufacturer shall supply for each Multi-Temp battery, a set of supply and return headers with necessary pipe taps for insertion of relief valves, tridicators and thermostatic controls. They should include the necessary quantity of pipe nipples, unions and self-aligning couplings for connection of the headers to the boiler nozzles.

I. The manufacturer shall furnish a low water cutoff for each boiler, as applicable and as approved by the State.

J. Installation shall be in accordance with manufacturer's instructions. Pertinent details of the design engineer's plan shall be combined with all rules and regulations of authorities having jurisdiction.

K. Furnish and install a Control Model-S Multi-Temp step control system as supplied by Hydrotherm, Inc. or equivalent including Heat Starter.

2.13 MODULAR HOT WATER BOILER BURNER UNIT (GAS-FIRED) (Continued)

L. After completion of installation, the heating plant shall be test started in the presence of a representative of the boiler manufacturer, and a start-up report, including control settings, and a performance chart of the step control system shall be furnished.

M. Sequence of Operation with Level III Controller:

1. The indicated modules are operated by means of modulating aquastats to maintain temperature for domestic water needs as provided by the heat exchanger. During low usage hours, one module maintains the temperature; as the load is increased and during peak loads, successive modules are fired to maintain the temperature.

2. The remaining modules are for heating only and are inoperative as long as the outdoor temperature is above the setting on the outdoor thermostat (supplied). When the temperature drops below this setting, (usually 65o), the RS-8 is energized, the heating modules and the system circulator are energized. The RS-8 automatically fires the heating boilers as they are needed to maintain the reset water temperature to the system as dictated by outdoor temperature.

3. When all heating modules are firing and unable to satisfy the heating load, item No. 8 of the RS-8 controller opens the motor valve of heat exchanger, allowing the water heating modules to boost the system water temperature to the required levels. To protect the domestic water needs, an L6006A is inserted in the heat exchanger shell and will shut the motor valve if the temperature in the shell drops below 160°, thus giving priority to domestic water needs by isolating water heating modules from the heating modules.

4. When the outdoor temperature reaches 65° (adjustable), the circulators and the RS-8 are de-energized, leaving only the water heating boilers in operation.

5. The entire hot water boiler installation shall be installed in accordance with manufacturer's installation specifications.

N. Boilers shall be as manufactured by Hydrotherm or similar by Slant-Fin or Utica.

2.14. HEAT TRACING

A. All pipes as indicated on the plans are to be electrically heat traced to provide freeze protection based on ambient to -10° F. The contractor shall furnish a complete system installed per manufacturer's recommendations. The cable shall be self-regulating as manufactured by CHROMALOX, type SRL 8 Watts/Foot, capable of being over lapped without causing cable failure from over heating. Bable shall meet U.L. and N.E.C. requirements. Installation accessory kits shall be provided as needed, including; power connection kits, splice, term nation kits, T kits, cable ties and pipe caution labels. Each circuit shall be controlled by ambient (ADJ) thermostat as supplied by the cable manufacturer. Ambient thermostats shall be bulb and capillay type for clamping to pipe as indicated. Thermostats shall be of weather tight design.

2.15 TURBINE VENTILATOR

A. Turbine ventilator shall be aluminum, 360 o operating surface with ball bearing and with 12 inch high prefabricated roof curb.

B. Motors shall be General Electric, Westinghouse, Allis Chalmers, or approved equal. All motors shall be 40 os C rise, built in accordance with IEEE standards. Each motor shall be equipped with an approved oiling device. Motors 1/2 HP and larger shall be 208 volt, 3 phase motors. Motors smaller than 1/2 HP shall be single phase motors for 120 volts, 60 cycle.

C. All motor starters, push buttons stations, and pilot lights shall be provided under this section.

2.16 ACCESS DOORS AND PANELS

A. HV Contractor shall furnish access doors for access to all concealed control devices and fire dampers. These access doors shall be installed by the General Contractor.

B. All access doors shall be located so that the damper can be easily reached, and the size shall be sufficient for this purpose (min. 12" x 15"). When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

C. Access doors shall be as specified in section 08305.

2.17 RISER HEAT EXCHANGER UNITS

A. Furnish and install as shown on drawings, vertical riser heat exchanger units. Units shall consist of base cabinet, riser heat exchanger, fan and motor, filter, single or dual supply air register and single return air register, remote thermostat, conduit and power wiring.

B. Cabinet shall be 22 gauge galvanized steel finish, with external surfaces suitable for securing of dry wall. Cabinet shall combine with fan board, top and internal baffles to make a rigid unit. All internal assemblies shall be welded, treated to prevent corrosion, and acoustically insulated with vapor proof insulation.

C. Riser heat exchanger shall consist of 1" x .035" x 108" long seamless copper tubes, which are mechanically expanded into .010 thick aluminum fins that have a stamped pattern for strength and rigidity. Units shall be of series loop construction for inherent self-balancing characteristics.

D. Drain Pan - 18 gauge galvanized steel, one piece box pan construction, all welded and completely rust proofed with high temperature mastic after fabrication, copper drain, mechanically rolled into pan and soldered, assuring complete leak proof operation.

E. Fan shall be two-speed centrifugal type designed for quiet operation. Motor shall be tap wound, shaded pole, two-speed construction and shall have all bronze oil impregnated bearings, and shall have built-in thermal overload protection. Fan and motor shall be easily accessible through return air grille.

F. Filter shall be 1/2" throwaway type.

G. Supply air register shall be steel adjustable double deflection bar type with opposed blade volume dampers on bedroom (rear) side only; return air grilles shall be steel fixed bar type.

H. Remote thermostats shall be heavy duty, (120) line voltage type with two-o maximum differential and integral two-speed fan switch. Thermostat shall be shipped separately. Cabinets shall be internally wired with in junction box for field mounting and wiring to thermostat, wiring between thermostat and unit shall meet electric code requirements.

2.17 RISER HEAT EXCHANGER UNITS (Continued)

I. Conduit and power wiring shall be factory installed and connected to fan and thermostat leads in accordance with U.L. standards. Cabinets shall have junction box at top connected to conduit with internal power wiring.

J. Units shall be as manufactured by Whalen or similar by International or Airtherm.

2.18 TESTS AND BALANCING

A. HVAC Subcontractor shall make tests of his work as required by the Architect durikng the progress of the work to demonstrate the strength, durability and fitness of the installation.

B. Air Balance: Air distribution system shall be balanced and adjusted by an independent air balancing contractor regularly engaged in this profession and employing qualified engineers and technicians. All instruments used for air balancing shall be calibrated immediately prior to taking readings, and calibration chart shall be made available to the Architect should be request it. A record of such balance shall be kept and shall include but not limited to:

1. Four readings per supply diffuser, return and exhaust register and grille, including neck size, velocity and cfm.

2. Readings for outside return, supply and exhaust air, including velocity readings, cfm and static pressure.

3. Supply and return air cfms, rpms, motor load amp, BHP, static pressure.

4. Duct sizes at points where readings are taken and average velocities at these points.

C. The final record of air quantities shall be delivered to the Architect within thirty days after completion of the installation of the various air systems.

D. Final inspection and release of building will no be made until after receipt of balancing report.

2.18 TESTS AND BALANCING (Continued)

E. All piping systems and related equipment shall be subject to a field hydrostatic test before insulation is applied. The duration of the tests shall be such that the Architect can make a thorough inspection.

F. Sufficient notice shall be given to the Architect to provide a representative who shall be present at the time of the tests. Any defects shall be fixed by replacing defective materials, and tests shall be continued until systems are free of leaks and proven tight under a pressure test of one and one half times the normal operating pressure.

G. Before testing and adjusting piping systems, rinsing shall be carried on until systems are free of oil, dirt or other impurities and all strainers then cleaned. Hot water systems shall be cleaned with a solution of No. 20 Oakite circulated through the systems for at least twenty-four hours.

H. All valves on hot water systems shall be adjusted to circulate the quantities of heating medium through the heat transfer equipment as indicated on the drawings or as required for satisfactory operation of each system. The final record of water quantities and operation of equipment shall be delivered to the Architect within thirty days after completion of the installation.

2.19 AUTOMATIC CONTROLS

A. General:

1. All control elements, except as noted, shall be of the electric type, as manufactured by Honeywell, Johnson, Coleman, or HVAC controls. Control diagrams and complete description of system shall be submitted to the Architect for approval before start of installation. The control systems shall be installed under the direct supervision of the Heating Subcontractor. The Heating Subcontractor shall assume complete responsibility for the instruction and direction of the installation and for the inspection of the work in progress. The Heating Subcontractor shall perform all tests and make the necessary adjustments and provide free service of the installation for one year from the date of final acceptance.

2.19 AUTOMATIC CONTROLS (Continued)

2. All wiring for controls shall be furnished and installed under this Section of the Specifications unless indicated on the Electrical Drawings.

B. Extent of Systems:

1. The system shall be complete in all respects, including automatic dampers, damper motors, thermostat, relays and other control devices shown on the drawings, specified or as required, so as to perform the functions indicated and operated in the required sequence.

C. Settings:

1. All controls shall be set for the approximate values shown on the drawings or stipulated herein, but shall have provision for adjustment up and down within the range which is reasonable for the service performed. The setting shall be made at approximate points to avoid "bucking" between heating and cooling cycles, and differentials shall be set sufficiently wide apart to prevent hunting.

D. Guarantee:

1. The control system designated and specified herein shall be guaranteed to be free from original defects in workmanship and materials for a period of one year from written acceptance by the Owner.

E. Materials:

1. Thermostats for unit heater control shall be 120 volt, snap acting type.

2. Thermostats for all other units shall be electric, potentiometer type, suitable for modulating either damper motor valve.

3. Dampers and Operators:

   a. Control dampers shall be of low leakage type and have frames of not less than 2" in width and blades of #16 galvanized steel and shall be adequately braced to form a rigid assembly. No dampers shall have blades more than 6" wide. Dampers shall be

.19 AUTOMATIC CONTROLS (Continued)

painted with one coat of black lacquer. Two position dampers shall be of the proportioning or opposed-blade type. Dampers and jambs shall be complete with neoprene or vinyl edges and be of low leakage type.

b. Damper operators shall be suitable for modulating electric operation and shall fail closed to outside air position (spring return). Damper motors exposed to weather shall be either weatherproof type or enclosed with watertight cover.

4. Valves: All automatic control valves shall be equipped with equal percentage plugs and removable composition discs. All valves shall be suitable for electric modulating operation and shall be sized by the control manufacturer and guaranteed to be of sufficient size to meet the heating requirements.

F. Instruction and Adjustments:

1. On completion of job, the Contractor shall completely adjust, ready for use, all thermostats, valves, damper motors and relays provided under his contract. The Contractor shall provide a complete instructional manual covering the function and operation of all control components of the job. This manual shall be furnished to the Owner's personnel, and a competent technician shall be provided for instruction purposes.

2. The Contractor shall furnish a framed schematic control diagram under glass to be located at Owner's discretion.

G. Sequence of Control:

1. Pump Control: (Heat Mode)

a. Pump P-1 shall be controlled from an outside air thermostat located under a suitable corrosion resistant sun shield on north side of building.

b. Pump shall start when outside temperature drops to 60 os F outside and stop when outside temperature rises to 65 os F.

2.19 AUTOMATIC CONTROLS (Continued)

c. Provision shall be made for manually resetting above temperature, if required.

2. Pump P-2 shall have same control as Pump P-1 and shall be standby.

3. Pump Control: (Cool Mode)

a. Pump P-1 shall be started manually at starter in "Auto" position, pump shall be interlocked with chilled water flow switch.

b. In "Hand" position, pump shall run continuously.

c. See chiller sequence for cooling.

H. Automatic Smoke and Fire Dampers:

1. Smoke Exhaust Control: (RTAC-1 Unit)

a. On sensing of smoke by any floor smoke detector (located in corridor and furnished and installed by Electrical Subcontractor), all return air automatic dampers shall close, except on floor of incidence.

b. At same time, the automatic damper in supply air register at floor of incidence shall close to preset maximum position. The remainder being left open. Supply air fan shall continue to operate.

c. The automatic damper in return air duct shall close; outside air damper shall open fully; and damper to smoke exhaust fan shall open. Smoke exhaust fan shall operate, and RTAC - unit shall run (cooling shall be locked out). Also within this control the stair pressurization system and vestibule smoke system shall be energized.

d. A reset switch (furnished and installed on fire panel by Electrical Subcontractor) shall reset dampers to normal positions and shutoff smoke exhaust control.

2.19 AUTOMATIC CONTROLS (Continued)

e. All of the wiring for this system shall be furnished and installed by the Electrical Subcontractor to provide this sequence of control. The Mechanical Subcontractor shall coordinate with the Electrical Subcontractor.

f. Motor-operated control dampers (labelled A.C.D.) shall be interlocked to open/closed with respective fan start.

I. Smoke Vestibule:

a. Vestibule supply air fan shall start from smoke detectors furnished and installed by Electrical Contractor. An override starting device shall be furnished and installed to allow testing of system on a periodic basis.

b. When system is energized, supply and exhaust fans start. A reset switch shall be provided and installed to return system to normal position.

c. Motor-operated control damper (A.C.D.) shall be interlocked to open with fan start.

d. Vestibule pressure shall be maintained by static pressure controller with sensor in adjacent stairwell set at 0.10" and another controller with sensor set at 0.05" for outside air.

J. Control Sequence - Liquid Chiller:

a. The chiller shall be started by a manual "on-off" switch located in the mechanical room. With the switch in "on" position, the unit shall run automatically from a temperature controller located in the control panel.

b. If the freeze control and water flow switch are closed, the first stage, normally open, contacts close and energize the Circuit No. 1 liquid line solenoid. Refrigerant flow allows the evaporator pressure to rise in circuit one, and low pressure control is energized through low pressure control and compressor 1 starts in an unloaded condition.

2.19 AUTOMATIC CONTROLS (Continued)

Normally closed second state contacts open to disengage compressor No. 1 loader bringing compressor No. 1 to 100% capacity.

c. A further rise in water temperature closes the normally open third state temperature control contacts, energizing liquid line solenoid No. 2.

d. The normally closed state four contacts are opened through a further rise in water temperature to disengage the No. 2 compressor unloading solenoid and raises system capacity to 100%.

e. As return water temperature is lowered, the temperature control reverses the above sequences to engage unloading solenoids, reducing compressor capacities and disengaging liquid line solenoids allowing system to pump down.

f. Compressor and condenser fan starter/contactor holding coils are wired in series to pressure safeties oil failure switch and amperage overloads. Liquid line solenoids are in series to all operating safeties except high and low pressure controls. All control circuits are fused.

g. Contractor shall provide a multi-step sequencing controller to allow each chiller to come on line in response to temperature sensors in the return water system.

h. All outdoor chilled water piping shall be drained during the winter season.

K. Mechanical Room Ventilation

a. A reverse acting thermostat shall control ventilation cycle. At set-point (90 os F adjustable), exhaust fan shall start and automatic temperature control damper shall open. When temperature falls to 5 o below set-point, fan shall stop and damper shall close.

.19 AUTOMATIC CONTROLS (Continued)

L. Hot Water Unit Heater Control:

a. Hot water unit heater fan shall be cycled on or off as required by strap-on aquastat and by built-in thermostat or remote thermostat as indicated herein or on the drawings.

b. Each coil shall be controlled by a control valve.

c. Control valve shall be wired to unit control circuit to prevent heating operation when unit is in "Cool" mode.

d. In control "Heat" mode, cooling shall be locked out and the valve shall be controlled by unit space thermostat to maintain "Heat" setting.

M. Combustion Air Louvers

a. Sequence combustion air damper #1 to open when hot water boilers #1 are started and dampers #2 to open when hot water boilers #2 are started.

N. Electric Unit Heaters

a. Unit heaters to be furnished with built in controls by unit manufacture.

O. Roof Top HVAC Unit

a. Controls by unit manufacturer.

2.20 PACKAGED AIR COOLED LIQUID CHILLER

A. Furnish and install where shown on the plans, an air cooled liquid chiller. Unit shall have the capacity as shown on the plans and be as manufactured by York, Carrier, Trane or Bohn.

B. General - Each packaged air cooled liquid chiller shall be completely factory assembled including all interconnecting refrigerant piping and internal wiring of the air cooled condenser, compressors and cooler. The unit shall be capable of being rigged from the top without a spreader bar. The unit shall be shipped with a full operating charge of

2.20 PACKAGED AIR COOLED LIQUID CHILLER

R-22. Chillers shall contain two separate refrigerant circuits, each with a separate compressor for standby operation.

C. Hermetic Motor-Compressor:

The compressors shall be an accessible hermetic reciprocating type with all rotating parts statically and dynamically balanced. The compressor shall have forced feed lubrication system using a reversible positive displacement type oil pump. The compressor shall also include a suction strainer, oil strainer, crankcase oil sight glass, crankcase oil heater, and backseating seal cap type suction and discharge stop valves. The compressors shall be mounted on spring isolators.

The hermetic motor shall be high torque, 1750 RPM, refrigerant gas cooled and shall be protected with inherent three phase overload protection. The motor terminal box shall be located above the crankcase oil level. The motor shall operate on 208 volts, 3 phase, 60 hertz electrical power.

D. Capacity Control System:

The capacity control system shall modulate compressor capacity automatically in 5 steps. Unloading shall be controlled by a solid state temperature controller.

E. Cooler:

The cooler shall be direct expansion shell and tube type with refrigerant in the tubes and liquids to be chilled in the shell. The design working pressure of the cooler shell (liquid) side shall be 150 psig, and 450 psig for the tube (refrigerant) side. Refrigerant heads shall be removable. The cooler shall be equipped with a heater cable, covered with fiberglass insulation and protected with a steel jacket for freezeup protection to -20oF ambient. The cooler shall be constructed and tested in accordance with ASME Code requirements. The water connections shall be fully accessible without going through condenser sheet metal panel sections.

2.20 PACKAGED AIR COOLED LIQUID CHILLER (Continued)

F. Condenser Coil:

The condenser coil shall be constructed of seamless copper tubes, arranged in staggered rows, mechanically expanded into aluminum fins. The design working pressure of the condenser coil shall be 450 psig. The condenser should

include, as an integral part of the design, a subcooling circuit. The condenser coils shall be of a "V" bank arrangement and shall be fully protected by sheet metal panels.

G. Condenser Fans and Motors:

The condenser fans shall be propeller type, providing vertical air discharge. Fan blades shall be statically and dynamically balanced, protected above by anodized fan blade guards. Each fan shall be driven directly by an individual motor.

The condenser fan motors shall be of the three phase high torque type, inherently protected, ball bearing construction, permanently lubricated and equipped with five-year lubrication plugs.

H. Refrigerant Circuit:

The refrigerant circuit shall be constructed of copper tubing with brazed joints and shall include: shut-off valve with charging connection, sight glass moisture-liquid indicator, direct acting thermal expansion valve, solenoid valve and filter-drier. The entire suction line and liquid line between the expansion valve and the cooler shall be insulated with flexible close cell insulation.

I. Controls:

The unit shall have separate control and power sections. All controls and motor starting equipment shall be factory wired and mounted in weatherproof compartments, and shall include: control fuses, 3-position unit and individual refrigerant circuit (on-off pump-down) selector switches, high and low pressure cutouts, oil safety switch, freeze protection control; freeze high pressure and low pressure safety lights, interlocks for inherent motor protector, cooler heater thermostat, low ambient temperature control,

2.20 PACKAGED AIR COOLED LIQUID CHILLER (Continued)

recycling pump-down circuit, provisions for wiring in remote alarm, on-off stop switch, and air conditioning system time clock, fan ceiling pressure control, 3-phase solid state fan speed controls, high discharge temperature cutout, easily adjustable return water range temperature multistage solid state operating thermostat. A flow switch shall be furnished for field mounting. A factory supplied bracket for mounting the control and power wiring disconnect switches shall be included. The compressor power terminals shall be capable of accepting either copper or aluminum wire. Compressor motor starters shall be part winding or equivalent.

J. Head Pressure Control:

Refrigerant pressure sensing head pressure control shall be standard to maintain constant head pressure down to 30 ° ambient.

2.21 GAS-FIRED ROOF-TOP AC UNIT (Corridor System):

A. General - Units shall be factory assembled, piped, internally wired, and fully charged with R-22. Units shall be designed to operate at outdoor ambient temperatures as high as 120°F and shall be certified by ARI Standard 201 and 270, American Gas Association (AGA) specifically for outdoor applications using natural gas. All units shall be Underwriter's Laboratories listed. All units shall be designed for outdoor rooftop installation. Exterior surfaces of all units shall be phosphatized, zinc-coated steel with epoxy resin primer and gray green baked enamel. Units shall be as manufactured by Carrier, Trane or York.

B. Casing - All access panels shall be gasketed and provided with fasteners and handles. One inch, one pound foil-faced glass fiber insulation shall be heat exchanger section with same composition mat-faced insulation in evaporator section.

C. Refrigeration Controls - Refrigeration controls shall include condenser fan, evaporator fan, and compressor contactors, and 24-volt transformer, Safety controls shall include high and low pressure controls, winding thermostat, and compressor overloads. Cycle guard shall prevent unit cycling on overloads and safety controls shall be reset at thermostat inside the building.

2.20 PACKAGED AIR COOLED LIQUID CHILLER (Continued)

D. Compressor - All units shall have welded steel hermetic compressors; 3600 RPM. Crankcase heater shall be standard.

E. Evaporator Coil - All coils shall have seamless copper tubing of 3/8" OD, mechanically bonded to heavy duty aluminum fins and be factory pressure and leak tested at 300 psig.

F. Drain Pan - Evaporator pan shall be internally sealed and insulated with threaded drain connections in evaporator section.

G. Condenser Coil - Primary surface 3/8" OD, seamless copper tube with secondary surface mechanically bonded to heavy duty aluminum fins and factory pressure and leak-tested at 425 psig.

H. Indoor Air Fans - Shall be belt-driven, forward curved, centrifugal type fans equipped with adjustable motor sheave. The motor shall be thermally overload protected with permanently lubricated fan and motor bearings. Motor/fan assembly shall be completely isolated from unit with rubber mounts.

I. Condenser fans shall be direct drive, statically and dynamically balanced propeller fans, U.L. listed for outdoor protection with permanently lubricated motor.

J. Gas-fired heating section shall be completely assembled, wired, and piped gas-fired heating system within unit with design certified by A.G.A. specifically for outdoor application.

K. Heat exchanger shall be embossed, formed and seamed 18 gauge aluminized steel, factory tested for gas leaks and stress relieved, free floating design, located upstream of cooling coil.

L. Burners shall be stamped and seam welded 20 gauge aluminumized steel.

M. Forced combustion blower shall insure flame stability under varying wind conditions. Combustion blower motor shall not be in hot air stream.

2.20 PACKAGED AIR COOLED LIQUID CHILLER (Continued)

N. Electronic Ignition System - Pilot shall be lit each time thermostat calls for heat. Flame sensor shall prove pilot flame and turn on main burners. Should a loss of pilot flame occur, the main valve shall close, and the spark reoccur within 0.8 seconds. When thermostat is satisfied, both pilot and main burner shall be extinguished.

O. Filters shall be located within unit with 2" throwaway filters.

P. Roof mounting curb shall mate with roof top unit to provide support and complete weather tight installation. 12 gauge zinc-coated steel with wood nailer strip and supply/return opening gasketing shall be provided.

Q. Low ambient operation shall be provided to 0° F standard refrigeration system.

R. Manually-set outdoor air damper shall be provided for up to 25% outdoor air.

S. Enthalpy controlled economizer cycle shall be operated through room thermostat to automatically utilize outdoor air for free cooling. Automatically modulated return and outdoor air damper shall maintain proper discharge temperature into conditioned space and be equipped with lockout when outdoor temperature or relative humidity is too high for proper cooling. Adjustable minimum position control shall be provided.

T. Thermostat, complete with "Fan-Off-Auto" and "System-Heat-Cool" subbase shall be furnished by unit manufacturer. Magnetic starters shall be furnished and installed by unit manufacturer as prewired part of unit.

U. Central Control Panel: Standard thermostat subbase with heat, cool, off, fan-auto, and on position and for signal lights indicate power, pilot outage, clogged filters and reset relay. Power signal shows green indicating power available to unit. Power signal shows red indicating power outage, interruption or malfunction of electric system. Filter signal shows red when filter is clogged and needs replacement. Reset signal shows red if system out on any cooling safety controls. Night setback devices shall also be included.

2.20 PACKAGED AIR COOLED LIQUID CHILLER (Continued)

V. Unit manufacturer shall provide necessary roof curb for his unit. HV Contractor shall coordinate roof curbs with all necessary openings. Units shall be as manufactured by Trane, Carrier or York.

PART 3: EXECUTION

3.01 GENERAL

A. The Contractor, under this section of the specifications, shall be responsible for the supervision of his personnel and the inspection of equipment and appliance provided by him to assure a safe working environment in compliance with OSHA regulations. In addition, this Contractor shall immediately report to the General Contractor in writing, any possible violation of said OSHA regulations observed in areas occupied by his personnel. Failure to notify the General Contractor shall constitute this Contractor's acceptance of the working conditions and the responsibility therefore.

3.02 TEMPORARY OPENINGS

A. This Contractor shall ascertain from his examination of the drawings, whether any special temporary openings in the building for the admission of apparatus furnished under this Contract will be necessary. He shall notify the General Contractor accordingly. He shall pay all costs of making such openings in case of failure to give this notification in time for General Contractor to arrange for same during construction.

B. This Contractor shall provide suitable protection of all equipment furnished under this contract while stored at the job site and after installation. This protection shall be suitable to guard equipment items against damage from the weather or from construction activities. Such protection shall not be removed until directed by the Architect. The interior and exterior of all ducts, piping, equipment or system.

3.03 PROTECTION OF WORK AND PROPERTY

A. This Contractor shall take particular care to protect any finished work from injury or defacement and must remedy at his operation or the operation of any other Subcontractors.

B. This Contractor shall provide suitable protection of all equipment furnished under this Contract while stored at the job site and after installation. This protection shall be suitable to guard equipment items against damage from the weather or from construction activities. Such protection shall not be removed until directed by the Architect. The interior and exterior of all ducts, piping, and equipment, 3.03 PROTECTION OF WORK AND PROPERTY (Continued)

shall be kept in a clean condition, free from dirt and debris. All piping, ducts and equipment items shall be thoroughly cleaned before the startup of any equipment or system.

3.04 EQUIPMENT BASES

A. This Contractor shall provide metal and other bases and supports not part of the building for all equipment and erect all structural supports of proper size, type and strength throughout the work wherever necessary. This work and material shall be complete.

3.05 TESTS

A. In addition to tests required by codes and ordinances, this Contractor shall demonstrate tightness of all ductwork prior to concealment, and shall perform such tests, as required by the Architect to demonstrate the equipment is functioning as designed. These tests shall include balancing of ductwork, outlets, and registers. Written reports of all such tests shall be furnished to the Architect. All instrumentation and labor required for balancing and testing shall be furnished by this Contractor. This Contractor shall conduct the tests in the presence of the Architect.

3.06 WORKMANSHIP

A. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance.

B. All ducts and piping shall be run parallel or perpendicular to building lines, and shall be properly graded.

3.07 PIPING SYSTEMS

A. Installation of Pipe, Fittings And Valves:

1. Furnish and install piping approximately as indicated straight, plumb and as direct as possible. From right angles on parallel lines with building walls.

2. Keep pipes close to walls, partitions, ceilings. Offset only where necessary to follow walls as indicated.

3.07 PIPING SYSTEMS (Continued)

3. Locate groups of pipes parallel to each other; space them at a distance to permit applying full insulation and to permit access for servicing valves.

4. Design, fabricate and install all piping in accordance with the American Standard Code for Pressure Piping, ASA B 131.1.

5. Piping shall be accurately cut to measurements established in the field and worked into place without springing or forcing.

6. All piping shall be reamed to be free of burrs.

7. Keep pipes free from scale and dirt; protect open ends whenever work is suspended during construction to prevent foreign bodies entering and lodging there; use temporary plug, burlap or other approved material for protection.

8. No piping shall be run in outside walls.

B. Installation of Water Systems:

1. Mains, rises, branches, and connections shall be of sizes and arrangement as indicated on the drawings.

2. Pitch all piping up in the direction of flow.

3. Automatic vent valves shall be installed in the piping systems, where indicated on the drawings or as required at all high points of any piping.

4. Drain valves shall be located at the base of all low points in the piping systems and at all water connections to associated equipment and pumps. Drain valves shall be 3/4" hose bibbs.

C. Installation of Unions:

1. Provide unions, screwed or flanges where indicated and in the following locations, even if not indicated:

   a. In long runs of piping to permit convenient disassembly of alterations or repairs.

3.07 PIPING SYSTEMS (Continued)

b. In by-pass around equipment.

c. In connection to traps, tanks, pumps and other equipment requiring disconnection for repairs, replacement, location between shut-off and equipment.

D. Installation of Valves:

1. Provide shut-off valves where indicated and specified and in the following locations, even if not indicated:

    a. Risers and main branches at points of take off from their supply and return mains.

    b. Individual equipment units at inlet and outlet to permit unit removal for repairs without interfering with remainder of system.

2. Locate valves for easy access and operation.

3. Do not locate valves with stems below horizontal.

E. Pipe Welding: Piping 2 1/2" and larger shall be welded. Welders and welding shall be tested and approved in accordance with the American Standard Code for Pressure Piping ASA B 31.1.

F. Pipe insulators: Nonmetallic pipe insulators shall be installed between all copper and ferrous piping to prevent galvanic corrosion. Stainless steel nipples may be used.

G. Expansion:

1. Provide for taking up expansion in hot water supply and return mains and risers by means of loops, offsets, guides and anchors.

2. Use swing or swivel joints for connection from mains to risers and from risers to radiators.

3.08 INSULATION

A. All surfaces shall be clean and dry when insulation covering is installed. All foreign matter such as rust, scale, dirt, etc., shall be removed.

SECTION 16000
ELECTRICAL

PART 1.00 - GENERAL

1.01 GENERAL PROVISIONS

A. Applicable provisions of "General Conditions" govern work under this section.

B. The Electrical Contractor shall review all other sections of these Specifications for requirements therein affecting the work of this Section.

C. The Electrical Contractor shall conform to all sections of these Specifications and Drawings.

D. Contractors duties for work specified below shall include compliance with all Codes, Ordinances, Rules, Regulations, Orders, and all other requirements of Authorities which bear on performance of work.

1.02 SCOPE OF WORK

A. Furnish all labor, supervision, permits, certificates, materials, equipment, apparatus, accessories, supplies, tools, transportation, and services necessary for, and incidental to, all electrical work as shown on the Drawings and/or specified hereinafter to the full completion of installation and operation of the electrical system.

B. The principal items of work are as follows:

1. Temporary service.
2. Primary service.
3. Secondary service.
4. Grounding.
5. Power and lighting panels.
6. Lighting fixtures and lamps.
7. Safety switches.
8. Feeders to panels.
9. Branch circuit wiring.
10. Outlet boxes, receptacles, etc.
11. Telephone System.

12. Fire Alarm System.
13. Emergency Power and/or Lighting System.
14. All wiring for heating ventilating equipment, wherever required as indicated on Drawings.
15. Intrusion Alarm System.
16. Master Antenna System.
17. Apartment Intercom System.
18. Apartment load centers.
19. Emergency Call System.
20. Lightning Protection System.
21. All other systems, equipment, and work hereinafter specified and/or shown on the Contract Drawings.

C. It is the intent of the Specifications and the accompanying Drawings that the systems shall be furnished and installed complete. The Electrical Contractor shall furnish and install all conduit, wire, boxes, equipment, devices, and controls needed and usually furnished in connection with such work, whether specifically mentioned or not.

D. This Contractor shall refer to the Architectural, Structural, Plumbing, and Heating Drawings and all other Drawings associated with the project, prior to the installation or roughing of the electrical outlets, conduit, and equipment to determine the exact location of all outlets.

1.03 WORK NOT INCLUDED

A. The following items of labor and material incidental and/or related to the installation of the electrical work will be provided and/or installed under other sections of the Specification.

1. All cutting, patching, and furring.
2. Painting of all equipment and material other than factory finished.
3. Flashing.
4. Excavation and backfill.
5. Concrete work.

1.04 DEFINITIONS

A. The "Electrical Contractor" specifically means,the Contractor working under this section of the Specifications.

B. "Furnish and install" or "provide" means to supply, erect, install, and connect up complete, in readiness for regular operation, the particular work referred to unless otherwise specified.

C. "Piping" includes, in addition to pipe, all fittings, boxes, hangers, and other accessories relating to such piping.

D. "Concealed" means hidden from sight, in chases, furred spaces, shafts, hung ceilings, and embedded in construction.

E. "Exposed" means visible in sight, not installed "concealed" as defined above.

F. "Approved Equal" means any equipment or material which is equal in quality, durability, appearance, strength, design, and performance to the equipment or material specified and which will function adequately in accordance with the general design and is approved by the Engineer.

1.05 CODES AND STANDARDS

A. Unless otherwise specified or indicated, materials, and workmanship shall conform with the latest edition of the following Standards, Codes, Specifications, Requirements, and Regulations.

1. National Electrical Code.
2. State Electrical Code.
3. National Electrical Contractor's Association.
4. National Electrical Manufacturer's Association.
5. Underwriters' Laboratories, Inc.
6. Local Wiring Inspector.
7. All other State and Local Codes and/or Authorities having jurisdiction, including any and all other paragraphs of this Specification.

1.06 PERMITS AND FEES

A. The Electrical Contractor shall secure and pay for all required permits, utility company backcharges, N E T & T backcharges, Fire Department backcharges, inspections and licenses necessary for, and incidental to, the accomplishment of his work and the use of such work when completed.

B. The Electrical Contractor shall carry in his bid price, and pay all costs incurred for, standard and special tests to be performed in conjunction with this Contract that are necessary for, and incidental to, the accomplishment of his work and the use of such work when completed.

C. The Electrical Contractor shall, after completion, furnish to the General Contractor a Certificate of Final Inspection and Approval from the Local Electrical Inspection Department.

1.07 MATERIALS AND WORKMANSHIP

A. Materials and workmanship shall be the best of their respective kinds and in full accordance with the most modern construction methods.

B. Electrical materials and equipment of types for which there are Underwriters' Laboratories standard requirements, listings or labels, shall conform to their requirements and be so labeled.

1.08 TESTS

A. The right is reserved to conduct acceptance tests of all equipment, wiring or any other work furnished under these Drawings and/or Specifications to determine the fulfillment of specific requirements and/or design.

B. The Electrical Contractor shall conduct all such tests in the presence of authorized representatives of the Owner and at such times that the Owner may designate.

C. The Electrical Contractor shall perform all tests, supply all instrumentation, personnel and make all adjustments of equipment and wiring as may be necessary. Insulation resistance readings of all equipment and circuits shall be taken by the Electrical Contractor in the presence of the Owner's representative. Megger readings of less resistance than the recommended minimum as called for by the NEC shall be required or conductors shall be replaced by this Contractor at no cost to the Owner.

1.09 PORTABLE OR DETACHABLE PARTS

A. The Electrical Contractor shall retain in his possession and shall be responsible for, all portable and/or detachable parts and portions of the installation, including fuses, keys, locks, adaptors, blocking clips, inserts, lamps instruction, drawings and all other devices or materials that are relative

to, and necessary for the proper operation and maintenance of the electrical system until final completion of his work.

B. The Electrical Contractor shall replace all stolen, lost or damaged items relative to the installation and operation of the electrical system at his own expense before the building is accepted by the Owner.

1.10 PROTECTION AND CLEANING OF EQUIPMENT

A. All electrical equipment, upon receipt, shall be adequately stored and protected from damage.

B. After inspection, all electrical equipment shall be protected to prevent damage during the construction period. Openings in all conduits, raceways, fittings, and boxes shall be closed to prevent entrance of foreign materials.

C. Before completion of work and before final inspection, all damaged and/or defective equipment and material shall be replaced Clean all exposed surfaces of electrical equipment.

1.11 DRAWINGS AND SPECIFICATIONS

A. The Drawings and these Specifications are complimentary each to the other and any labor or material called for by either, whether or not by both, or necessary for the successful operation of any of the particular types of equipment furnished under this Contract, shall be furnished and installed.

B. Before installing any of the electrical work, see that it does not interfere with the clearances required for existing finished columns, pilasters, partitions, or walls. Installed work, which interferes with other trades, shall be changed as directed by the Owner's representatives. All costs incidental to such changes shall be paid by the Electrical Contractor.

1.12 OBTAINING INFORMATION

A. Obtain detailed information from the manufacturers of apparatus which he is to furnish and install as to the proper method of installing and connecting same. Obtain all required information from the Owner's representative and other Subcontractors necessary to facilitate and complete the electrical work. Check all other Contract Drawings and all other sections of Contract Specifications for electrical equipment requiring connections and electrical characteristics of equipment should they differ from the Electrical Drawings.

1.13 SAFETY PRECAUTIONS

A. The Electrical Contractor shall furnish, place, and maintain power guards and other necessary construction, required for the prevention of accidents and to secure safety of life and/or property.

B. In addition to the cleaning up required in the Special Provisions, the Electrical Contractor shall, at the completion of the work, clean, polish, and/or wash all exposed items or material, equipment, and fixtures in his Contract, so as to leave such items bright and clean.

C. Any painted metal surfaces which have been scratched, dented, or marred shall be repainted by the Electrical Contractor.

1.14 REMOVAL OF RUBBISH

A. After completion of the work, the Electrical Contractor shall remove all waste, rubbish, and other materials left as a result of his operations and leave the premises in clean condition.

B. In addition to the cleaning up required in the Special Provisions, the Electrical Contractor shall, at the completion of the work, clean, polish, and/or wash all exposed items or material, equipment, and fixtures in this Contract, so as to leave such items bright and clean.

C. Any painted metal surfaces which have been scratched, dented, or marred, shall be repainted by the Electrical Contractor.

1.15 COORDINATION OF TRADES

A. The Electrical Contractor shall give full cooperation to other trades and shall furnish (in writing, with copies to Designers) any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.

B. Where the work of the Electrical Contractor will be installed in close proximity to work of other trades or where there is evidence that this Contractor will interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Designer, the Contractor shall prepare composite working Drawings and sections at a suitable scale not less than 1/4" = 1'0", clearly showing how his work is to be installed in relation to the work to correct the condition without extra charge. All cutting and patching, excavation, and backfill shall be done by the

General Contractor. The Contractor shall inform the General Contractor well in advance as to his requirements.

1.16 VISITING THE SITE

A. The Electrical Contractor shall be required to visit the site and examine the existing conditions which may affect his work under this Contract. Failure to do so shall be his responsibility and no claims for extra compensation or extension of time shall be allowed because of lack of compliance herewith.

1.17 FIELD MEASUREMENTS

A. The Electrical Contractor shall verify in the field all measurements necessary for his work and shall assume responsibility for their accuracy.

1.18 GUARANTEE

A. The Electrical Contractor guarantees by his acceptance of the Contract that all work installed will be free from any and all defects in workmanship and/or materials during period of one (1) year from date of Certificates of Completion and acceptance of work. If any such defects in workmanship or material appear, he will, without cost to the Owner, remedy such defects within a reasonable time.

1.19 SHOP DRAWINGS AND SAMPLES

A. Before ordering material shipped to the job, the Electrical Contractor shall submit to the General Contractor for approval manufacturers' references and bulletins, Shop Drawings, in sextuplet, giving all details, dimensions, etc. of the following:

1. Light and power panels.

2. Main service equipment.

3. All lighting fixtures.

4. Time switches.
5. Disconnect switches.
6. Lightning Protection System.
7. Fire alarm equipment.
8. Emergency Power and/or Lighting system equipment.
9. Fire alarm equipment.
10. Electric Heating equipment.
11. Emergency call equipment.
12. Apartment intercom equipment.
13. M.A.T.V. equipment.
14. Telephone system equipment.
15. Intrusion Alarm System.

B. The Electrical Contractor shall also furnish samples of plug receptacles, light switches, and other small parts as requested by the Architect.

C. Should the Electrical Contractor choose to substitute for the specified equipment, the Shop Drawing submittals must include catalog cuts of originally specified equipment. Shop Drawings submitted for approval without all of the required information will not be considered for approval.

1.20 SUPERINTENDENCE OF WORK

A. The Electrical Contractor shall give his personal superintendence to the work and shall retain at the job site during the period of construction, a competent Foreman, satisfactory to the Contractor, who shall be in full charge of the work under this section.

1.21 STORAGE OF MATERIALS

A. The Electrical Contractor shall store his material and equipment prior to installation only where designated by the General Contractor. He shall be responsible for all his property stored on the premises and shall hold the General Contractor free from liability for loss by theft or carelessness of employees of the General Contractor or of other Sub-Contractors. The Electrical Contractor shall take particular care to protect any finished work for injury or defacement and must remedy, at his expense, any injury caused thereto by his operations.

1.22 RECORD DRAWINGS

A. The Electrical Contractor shall maintain at the site a set of black line prints on which shall be accurately shown the actual installation of work under this section, indicating thereon any variation, approved by the General Contractor, from the Contract Drawings, including changes in sizes, locations, and dimensions. At the conclusion of the work, the Electrical Contractor shall deliver to the General Contractor for submittal to the Owner, a complete set of reproducible Record Drawings on mylar, showing the entire work as actually installed and two (2) sets of black or blue line on white prints.

1.23 CONTRACT DRAWINGS

A. The Contract Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, conduits, piping, and fixtures. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the General Contractor before being installed. The Electrical Contractor shall follow drawings in laying out work, and shall check Drawings of the trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. The General Contractor shall be notified before proceeding with the installation.

B. If directed by the General Contractor, the Electrical Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

1.24 TEMPORARY SERVICE

A. Furnish and erect a suitable backboard for temporary meters and switches to measure and control current for testing, wiring, motors and other appliances; for temporary lighting and for operating floor surfacing machines or other apparatus used in the construction of the building, until such time as the permanent meter is installed. Furnish and mount on this temporary board, an approved type of service switch and do all necessary wiring to connect such circuits as are required.

B. Special heavy duty circuits shall be paid for by the trade requiring same.

C. Obtain city wiring permit for the temporary wiring and pay all fees for same.

PART 2.00 - PRODUCTS

2.01 RIGID STEEL CONDUIT

A. All rigid steel conduit shall have a hot-dipped galvanized coat plus a secondary coat, galvanized threads, bear an Underwriters' Laboratories label and shall conform to Federal Specifications WW-C-581d and American Standards Association Specification C80.1. The conduit shall be fully threaded at both ends and each length shall be furnished with one standard threaded coupling. The use of threadless conduit couplings and fittings will not be permitted. Threaded split couplings of the bolted clamp type are permitted. Rigid steel conduit shall be used for all power wiring where indicated.

2.02 ELECTRICAL METALLIC TUBING

A. Electrical metallic tubing shall be electro-galvanized outside and enameled inside. All electrical metallic tubing shall bear an Underwriters' Laboratories label and shall conform to Federal Specifications WW-C-563 and American Standards Association Specification C80-3.

B. Couplings and fittings for EMT shall be of the compression type or screw type. EMT shall not be installed embedded in concrete, outdoors or in wet locations.

2.03 FLEXIBLE METALLIC CONDUIT

A. Flexible metal conduit shall be galvanized steel, and shall contain an integral copper grounding conductor.Liquid-tight flexible metal conduit shall be similar, but shall also have an extruded moisture and oil-proof outer jacket of polyvinyl chloride plastic.

2.04 PVC CONDUIT

A. Plastic conduit shall be PVC Schedule 40, iron pipe size, rigid polyvinylchloride equal to or better than ASTM Pipe Material ASTM PVC conduit Type 2, Grade 1, ASTM PVC 2110, Specification P-1785, Underwriters' Laboratory, Inc. approved for lengths beyond ten (10) feet shall be identical to the approved conduit. Where elbows are used, they shall be long radius type. PVC Conduit shall be manufactured by Kraloy, Barrett Division of Allied Chemical, Pittsburgh; Triangle Cable and Conduit Co., or approved equal.

2.05 WIREWAYS

A. Totally enclosed sheet steel wireways, complete with all fittings, tees, elbows, wire retainers, closure plates, hangers, and component parts required for a complete installation shall be installed in all areas indicated on the Drawings and as required to facilitate the installation of the electrical systems.

B. Physical size, length, and internal cross sectional areas, of the wireways shall be determined in the field by the Electrical Subcontractor to suit field conditions unless noted otherwise on the Drawings.

C. The wireway systems shall be constructed of code gauge galvanized sheet steel with hinged cover. Straight sections of the wireway system shall be constructed of two separate pieces of sheet steel. One piece shall be used to form the sides and top, the other to form the cover. Captive screws, furnished as a part of the wireway system, shall be used for sealing at all hinged covers and coupling at straight sections or fittings.

D. All fittings, elbows, tees, and straight sections of the wireway shall be provided with smooth and round edges to protect the wiring from abrasion. All welded seams and joints shall be ground and polished to remove slag and burred edges.

E. A bonding jumper consisting of an insulated flexible #8 AWG copper conductor with soldered eyelet on each end shall be provided to bound and ground the wireway at each joining section of the wireway system. The bonding jumpers shall be attached to each section by means of a bolt, locknut, and washer. The Electrical Subcontractor shall remove the paint from the wireway at the contact points so that positive contact shall be made between the bare metals at each grounding point.

F. The wireway system shall be provided with 1/2 inch and 3/4 inch concentric knockouts every 6 inches on center along the top and 1/2 inch, 3/4 inch, 1 inch, and 1-1/4 inches concentric knockouts every 6 inches along both sides.

G. All sheet metal posts shall be factory primed with rust inhibiting phosphor coating and finished with USASI #24 dark gray enamel. All hardware shall be cadmium-plated to prevent rusting and corrosion.

H. All lengths, connectors, and fittings of the wireway systems shall be UL approved and bear the Underwriters' Laboratories label. UL listing of lengths without listing of connectors and associated components or fittings shall not be acceptable.

I. The wireway system, all component parts and fittings, shall be by one manufacturer and shall be manufactured by Kelek, Lee Products, or Keystone.

2.06 OUTLET, PULL AND JUNCTION BOXES

A. The locations of all wall switch boxes shall be coordinated with the Architectural Drawings before installation of same. All switch boxes, unless specifically noted otherwise on the Drawings shall be opposite the hinged side of the door for all single doors.

B. The location of outlets shown on Drawings are approximate. The Electrical Contractor shall study the building plans in relation to the spaces and equipment surrounding each outlet, so that receptacles, switches, lighting fixtures, devices, or other electrical components are symmetrically located and mounted in or on the walls, ceiling, and floor.

C. Outlet, junction or pull boxes, shown on the Drawings, that interfere with the installation of mechanical equipment, structural or architectural features, or that will be inaccessible due to the work of other trades shall be relocated accordingly.

D. Outlet, junction or pull boxes that are not specifically shown on the Drawings but are required for the proper installation of the electrical system shall be installed by the Electrical Contractor, so that they do not interfere with the structural or architectural features and the installation of materials by the other trades.

E. Any reasonable change in the location of outlets, pull or junction boxes requested by the Architect, prior to roughing, shall not involve additional expense to the Owner.

F. All outlet, pull and junction boxes shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame constructions or shall be fastened directly with wood screws on wood, bolts with expansion shields on concrete or brick, toggle bolts on hollow masonry units and machine screws or welded threaded studs on metal. Threaded studs of the proper type and holding capacity driven in by a powder charge and provided with lock washers and nuts are acceptable for mounting of boxes on solid concrete walls or slabs. Preset inserts of the proper type and holding capacity shall be used in overhead slab construction wherever possible for the support of pull and junction boxes.

G. Feeders passing through pull or junction boxes shall be individually grouped and bound with ty-raps. The feeders in each pull or junction box shall be properly tagged to clearly indicate their electrical characteristics, circuit number and panel designation. Cables shall be supported on suitable racks within the boxes and arranged in an orderly manner.

H. Multi-gang outlet boxes for wall mounted toggle switches containing multi-voltage switch legs (120V and 277V) or more than one 277V switch leg, or both, shall be provided with N.E.C. approved isolation barriers between switches.

I. Flush mounted ceiling and wall outlet boxes shall be provided with the proper type extension rings, tile and plaster collars required to set flush with the finished surfaces of the ceiling or walls.

J. Outlet boxes shall, in general, be as follows:

1. Exposed, surface and pendant mounted outlet boxes or outlet boxes installed in normally wet locations shall be of the cast metal type with threaded hubs.

2. Recessed outlet boxes for non-hazardous locations shall be of the pressed sheet steel, zinc coated, cadmium plated type.

3. Outlet boxes shall not be less than 1-1/2 inches deep unless shallower boxes are required by structural conditions and are specifically approved by the Architect.

4. Ceiling and bracket outlet boxes shall not be less than 4 inch octagonal, except that smaller boxes may be used where required by the particular fixture to be installed. Flush or recessed fixture shall be provided with separate outlet boxes where required by the future terminal temperature requirements.

5. Outlet boxes for general use, flush mounted in concrete work and walls in non-hazardous and normally dry locations, shall be manufactured by Steel City, Appleton, or Raco.

6. Outlet boxes for normally wet locations and surface or pendant mounted in all locations, shall be of the proper cast metal type and shall be manufactured by Crouse-Hinds, Appleton, Red Dot, or Russell and Stoll.

7. Floor outlet boxes shall be of the adjustable, water tight type, single or multi-outlets, as required, complete with coverplate to accommodate the devices as indicated on the Drawings. Boxes and coverplates shall be manufactured by Steel City, Appleton, Russell and Stoll or Lew. Pedestal type floor outlet boxes for receptacle and telephone outlets shall be similar to Walker #500-AL series or approved equal as manufactured by the above the indicated manufacturer.

K. Pull and junction boxes shall, in general, be as follows:

1. Pull and junction boxes shall be constructed of code gauge galvanized sheet metal, of not less than minimum size required by the N.E.C. or other applicable Specification "STANDARDS" and shall be furnished with securely fastened covers. Boxes exceeding 48 inches in any direction shall be properly reinforced with angle iron stiffeners.

2. Pull and junction boxes of other than standard manufacturer's trade size shall be manufactured by Keystone, Lee Products or Empire.

3. Standard trade size pull and junction boxes shall be produced by the manufacturers listed above as applicable.

4. Pull and junction boxes to be installed in normally wet location areas shall be of the cast type with threaded hub and gasketed coverplate. The cast pull and junction boxes shall be manufactured by O.Z., Crouse-Hinds, or Appleton.

L. Outlet, pull, and junction boxes shall be properly sealed during the course of construction to prevent the entrance of dirt and foreign materials within same or the raceway system of which it is a part. The Electrical Contractor shall provide temporary covers for all open boxes. Paper may be solidly packed into standard work boxes to prevent the entrance of dirt and foreign materials, in lieu of coverplates if so elected by the Electrical Contractor.

2.07 NON-METALLIC SHEATHED CABLE

A. All conductor wires and cables for secondary circuits shall consist of thoroughly tinned 98 percent conductivity copper, with 600 volt thermoplastic-covered (75 degrees C) insulation manufactured in strict accordance with the requirements of the Board of Underwriters' and A.I.E.E..

B. Wires, #10-2, #12-2, and #14-2 non-metallic sheathed cable, shall be type "TW" solid, unless otherwise noted or shown on plans; sizes #6 AWG and larger shall be stranded Type "THW". Wires underground or in slabs on grade shall be "THW" in galvanized conduit, unless shown or noted otherwise.

C. No wire smaller than 14-2 non-metallic sheathed cable shall be used for any branch circuit. Larger sizes shall be used where so indicated on the Plans.

1. 12-2 non-metallic sheathed cable in 20 amp circuits for Kitchen, Dining Room where indicated.

2. 14-2 non-metallic sheathed cable for other general wiring in apartments.

D. All wire shall be color coded.

E. All wire and cable shall be as manufactured by General Cable, Rome Cable, Anaconda, or approved equal.

2.08 ARMORED CABLE

A. All conductor wires and cables for secondary circuits shall consist of thoroughly tinned 98 percent conductivity copper, with 600 volt thermoplastic-covered (75 degrees C) insulation manufactured in strict accordance with the requirements of the Board of Underwriters' and the A.I.E.E..

B. Wires, #10-2, #12-2, and #14-2 armored cable, type "AC", shall be type "TW" solid, unless otherwise noted or shown on Plans; sizes #6 AWG and larger shall be stranded Type "THW". Wires underground or in slabs on grade shall be "THW" in galvanized conduit, unless shown or noted otherwise.

C. No wire smaller than 14-2 armored cable shall be used for any branch circuit. Larger sizes shall be used where so indicated on the Plans.

D. All wire shall be color coded.

E. All wire and cable shall be as manufactured by General Cable, Rome Cable, Anaconda, or approved equal.

2.09 WIRES AND CABLES

A. Unless otherwise specified, all wires and cables shall be thoroughly tinned 98% conductivity copper, single conductor type "TW" moisture and heat resistant polyvinylchloride thermoplastic for use at 600 volts A.C. and D.C., rated 60 degrees C. operating temperature. Wires and cables #6 AWG and larger shall be type "THW", unless noted otherwise. The wires and cable shall have the Underwriters' Laboratories, Inc. label and be surface printed throughout the entire length at two foot intervals with permanent identifying markings indicating manufacturer's name, size, type, and voltage. All wire and cable shall be furnished on reels or spools and in lengths required to minimize splicing.

B. Fixture wiring for use on 250 volts A.C. shall be type XFF, cross linked, polyfin insulated, #14 AWG, 300 volts.

C. Branch circuit wire in continuous raceways of fixtures shall be type "THHN", heat resistant, nylon covered thermoplastic.

D. Wires of #14, #12, and #10 AWG shall be solid, #8 AWG and larger shall be stranded.

E. Wires and cables #2 AWG and smaller shall be of continuous solid color as follows:

1. SYSTEM VOLTAGES:

CONDUCTOR	120/240 OR 120/208 1 PHASE, 3 WIRE	120/208 3 PH,4 WIRE	277/480 3 PH, 4 WIRE
Phase A	Black	Black	Brown
Phase B	Red	Red	Orange
Phase C	---	Blue	Yellow
Neutral	White	White	White/Gray Stripe
Equip.Grd.	Green	Green	Green/Gray Stripe

2. All wires larger than #2 AWG shall be color-tape coded at all terminations.

2.10 BUS DUCT SYSTEMS

A. The Electrical Contractor shall furnish and install, complete in every respect, low voltage bus duct as shown on the Drawings.

B. The bus ducts shall be listed by Underwriters' Laboratory Inc. and so labeled unless otherwise noted. The system shall be complete with all devices, fittings, and necessary appurtenances.

C. The bus duct casing shall be formed of 2 steel halves. Splice plates with captive bolts shall be furnished with the duct to secure the casing. Bus bars shall be zinc plated copper and shall be supported every 10" within the casing with non-tracking insulators.

D. Hangers for the bus duct runs shall be suitable for edge mounting and of such a design that they may be installed at any point along the run. Two hangers shall be supplied with each length so that the busway may be supported every 5 feet. The Electrical Contractor shall supply the support rods or brackets to which the hangers are attached.

E. The bus ducts shall be of the low impedance, type, and finished ASA #24 dark gray and shall be manufactured by Square D, ITE, or General Electric.

F. Bus Duct Ratings:

The bus duct shall be rated voltage, phase, and ampere rated as indicated on the Drawings. The bus ducts shall be braced for an asymmetrical short circuit of 22,000A at the rated system voltage.

The connections to the bus ducts shall be of the plug-in type. Plug-in connection shall be provided approximately every 2 feet 9 inches along both sides of the bus duct for plug-in connections.

2.11 LIGHTING FIXTURES

A. The Contractor shall furnish and install the lighting fixtures, complete for each and every light outlet in the type quality, and size of fixture indicated on Plans and in the Fixture Schedule, unless called for specifically to be omitted herein. It shall be the responsibility of this Contractor to check the Plans with the Schedule for completeness, as this Schedule is made up for the convenience of the Bidders. In the Schedule, Catalog Numbers are used for the purpose of indicating the general type, quality, and size of fixtures that will be required.

B. This Contractor shall include all fixture wiring, hanging, uncrating, connecting up and making ready for operation. All fixture wire for fixtures shall not be less than #16 gauge, but larger if capacity of fixture requires it, and finished with asbestos-covered wires where exposed to excessive heat.

C. This Contractor shall include the cost of furnishing and installing all lamps for all fixtures under this Contract throughout. All lamps for all fixtures shall be furnished in type A, PS, PAR, or B or silvered as specified. All tubes for Rapid-Start fixtures shall be General Electric, Westinghouse, or Sylvania, as called for under each fixture type.

D. The Contractor shall check structural and architectural details of all locations where fixtures are to be installed so that he can properly provide for installation of the fixtures.

2.12 LIGHT SWITCHES (RESIDENTIAL GRADE)

A. All local wall switches shall be of the flush Quiet toggle type, single pole, double pole, three-way or four-way, as required as manufactured by Leviton, P & S or Hubbell.

B. All switches shall be suitable for the control of tungsten filament lamps and fluorescent loads and shall carry the proper marking of the Underwriters' Laboratories.

C. Switches shall be equal to the following:

1. Single-pole	Leviton	1451-2I	Ivory or equal
2. Three-way	Leviton	1453-2I	Ivory or equal

2.13 RECEPTACLES (RESIDENTIAL GRADE)

A. All convenience outlets shall be of the single or duplex type, back or side wired, T-slot or polarized slot type, grounded, as required, as manufactured by Leviton or equal, but shall be of the same manufacturer as switches selected by Contractor.

B. In general, convenience outlet circuits shall be independent of light circuits and shall not be controlled by light circuit switches or light switches, unless specifically shown.

C. Duplex receptacles in Kitchen and Dining Areas shall be fed from a 20A circuit in apartment load centers with #12 wire.

D. Standard duplex receptacles specified shall be used for dual circuited receptacles, by removal of break-off shunt.

E. Bodies shall be of ivory phenolic compound, unless noted otherwise, supported by mounting yoke having plaster ears and shall be "Standard Grade". Receptacles shall be side or back wired with two screws per terminal. All receptacles shall be the grounding type and shall be connected to metal mounting yoke. A terminal shall be provided for ground wire on all receptacles.

F. All receptacles installed throughout the building complex shall be as follows, or equal to:

1. Duplex convenience receptacles 20A, 125V., single phase, 3 wire U-slot grounded type shall be Leviton #2660-I or equal as manufactured by P & S or Hubbell.

2. Duplex 15A; 20A feed-thru, 125V, 1-phase, 3-wire, U-slot ground fault interrupting convenience receptacle shall be Leviton #6599-I or equal as manufactured by P & S or Hubbell.

2.14 MISCELLANEOUS GENERAL PURPOSE DEVICES (RESIDEN. GRADE)

A. All other special and general purpose receptacles called for on the Drawings shall be of "Residential grade", ivory phenolic compound finish and manufactured by Leviton, P & S, Hubbell, or equal.

2.15 DEVICE PLATES (RESIDENTIAL GRADE)

A. All plates used on switch and plug receptacles in finished spaces where wiring is concealed, shall be non-metallic type. Plates on exposed condulates to be sherardized. Non-metallic type shall be ivory color to match devices.

B. Gang plates shall be used where multiple switches and/or receptacles occur at one location.

C. Plates shall be of the same manufacturer as the wiring devices.

2.16 FLUORESCENT BALLASTS

A. All fluorescent ballasts as indicated shall be of the high-power factor, energy saving type and their design and construction shall conform to the CBM Standards certified by ETL.

B. The ballast fill material shall be of thermosetting type and shall not soften under failure. The ballasts shall be equipped with an internal automatic resetting thermal protector adjacent to the coils. The ballast case temperature shall not exceed 90 degrees C in continuous operation.

C. Rapid-start ballasts shall be MARK III, Full Light Energy Saving as manufactured by Advance Transformer Company or approved equal, as manufactured by Jefferson or Universal.

D. Ballasts 800 MA and 1500 MA shall be rapid start HPF, Class P and shall be in accordance with the schedule set forth by the National Electrical Code.

2.17 A.C. PANELBOARDS

A. The convertible distribution and lighting circuit breaker panelboards shall be the dead-front type and shall be in accordance with the Underwriters' Laboratories, Inc.. "Standard for Panelboards", and

"Standard for Cabinets and Boxes" and shall be so labeled.

1. All cabinets shall be made of code gauge steel or better and if painted shall be undercoated with a rustproof bonderized surface or galvanized and treated with a non-acid agent prior to painting. Fronts, provided with doors, shall be cold-rolled sheet steel with gray finish. Directory frames shall be included on the backs of all doors. All locks shall be keyed alike. Fronts shall be furnished with approved adjustable trim clamps and means shall be provided for entrance to gutter space, lugs, etc.

2. Circuit breakers shall be of the bolt-on type, stab types will not be permitted, indicating "ON-OFF" "TRIPPED" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position between an overload on one pole shall automatically cause all poles to open. Two or more single pole breakers with one handle extension will not be permitted. The circuit breakers shall be quick-break on manual, as well as automatic operation and shall have inverse time characteristics secured through the use of a bi-metallic tripping element supplemented by a magnetic trip. Circuit breaker arc quenching shall be equal to or better than the "De-Ion" arc extinguishing principle.

3. All panelboard assemblies shall be factory assembled complete with circuit breakers as shown on the Contract Plans. Interiors shall be so designed and assembled that any individual breaker can be replaced without disturbing adjacent units or without removing main bus or branch circuit connectors. All bussing shall be copper. Main buses and back pans of distribution and power panelboards shall be of such design that branch circuits may be changed without additional machining, drilling, or tapping. Where copper contact surfaces are furnished on main and branch circuit connectors, the copper shall have a 1,000 amperes/square inch density and contact surfaces of not more than 200 amperes per square inch. Silver Plated contacts which meet the same values are acceptable. Lighting and power branch circuit panelboards shall be so designed that the branch circuit connections to the main bus provide sequence (fully distributed) phasing, and such connections shall be clearly and permanently identified on the face of the front of the panel interior.

B. A.C. Power Distribution Panels shall be convertible circuit breaker distribution panelboards Square D type

"CDP" or approved equal as manufactured by I.T.E., General Electric, or Westinghouse. Frame size for each breaker shall be as shown on the Contract Plans. All bussing shall be copper. The bare, solid, copper neutral bus shall be electrically insulated from the panel and a separate, bare copper grounding bus shall be provided in each panel. Copper grounding bus shall be the equivalent of the solid neutral bus. Buses shall be clearly identified.

C. A.C. Lighting Panels shall be circuit breaker panelboards Square D Type "NLAB" or approved equal as manufactured by I.T.E., General Electric, or Westinghouse. Frame size for each breaker shall be as shown on the Contract Plans. All bussing shall be copper. The bare solid copper neutral bus shall be electrically insulated from the panel and a separate, bare copper grounding bus shall be provided in each panel. Copper grounding bus shall be the equivalent size of the solid, neutral bus. Buses shall be clearly identified.

2.18 APARTMENT LOAD CENTERS

A. Apartment load centers shall be sized and rated for the quantity of circuit breakers as shown on the Drawings, and shall be Square D, I.T.E., General Electric, or equal.

B. All apartment panels shall be for flush mounting and have trim with doors over breaker handles.

C. Circuit breakers for apartment load centers shall be type for single and double pole circuits. One-half (1/2") inch breakers, or tandem, will not be acceptable.

D. Size and number of breakers shall be as shown on apartment load centers schedule on Drawings.

E. All bussing shall be copper.

2.19 MULTIPLE METERING EQUIPMENT

A. Multi-metering equipment shall be wall mounted. All components shall have been tested and Underwriters' Laboratories listed for use as an integral part of the multi-metering system. Installation shall be made as herein specified and shown on the associated Electrical Drawings.

B. Enclosures shall be constructed of formed and welded code gauge steel, finished with gray baked enamel over a corrosion inhibiting phosphate treatment and suitable for indoor or outdoor surface mounting. No device dissembling is to be required before mounting. Mounting shall be accomplished by using a separate mounting channel in conjunction with enclosure embossments for vertical support. Final mounting shall be by the use of external mounting feet for attaching to walls. All devices must be bonded together with bolted connections. Meter units shall be provided with individual removable covers for each meter position. All compartments containing unmetered circuits shall be provided with a sealing means. All bussing shall be copper. Voltage, phase, and ampacity ratings shall be indicated on the plans.

2.20 SAFETY SWITCHES AND FUSES

A. Safety switches shall be of the fusible or non-fusible type as indicated on Drawings equipped with an external lever or handle for manual operation. Each unit shall be enclosed in a code-cage, sheet steel cabinet suitable for surface mounting as indicated on the drawings. Surface mounted units shall have hinged door and catches. Neutral conductors shall be solid throughout. Weatherproof switches shall be of the NEMA 3R type.

B. Safety switches shall be heavy duty type as manufactured by Square D Company, General Electric Company, Westinghouse, or I.T.E..

C. Furnish and install a complete set of fuses for installation and deliver to the Owner one complete set of spare fuses for each installation. Fuses shall be as manufactured by Chase Shawmut, Bussman, or Littlefuse/Tracor.

2.21 GENERAL PANEL INFORMATION

A. All panels shall be properly balanced, the circuit numbers on the Plans being a numerical indication rather than any attempt to indicate proper balance.

B. Care shall be taken in the use of a common neutral to make certain that no more than one leg is taken from each phase.

C. Typed indexes shall be provided in each panel indicating circuit number and the outlets or items controlled or fed from same.

2.22 MAIN DISTRIBUTION EQUIPMENT

A. Furnish and install the service entrance switchboard as herein specified and shown on the associated electrical Drawings. The switchboard shall meet Underwriters' Laboratories enclosure requirements.

B. The switchboard framework shall be fabricated on a die-formed base or base assembly consisting of formed steel and commercial channel welded or bolted together to rigidly support the entire shipping unit for moving on rollers and for mounting. The framework is to be formed code gauge steel, rigidly welded and bolted together to support all cover plates, bussing, and component devices during shipment installation. Each switchboard section shall have an open bottom and individual removable top plate for installation and termination of conduit. Top and bottom conduit area is to be clearly shown and dimensioned on the Shop Drawings. The wireway front covers are to be hinged to permit access to the branch breaker load side terminals without removing the covers. All closure plates shall be screw removable and small enough for easy handling by one man. The paint finish shall be gray enamel over a rust-inhibiting phosphate primer.

C. The switchboard bussing shall be plated copper and of sufficient cross-sectional area to continuously conduct rated full load current with a maximum average temperature rise of 65 degrees C. above an ambient temperature of 40 degrees C. The bus bars shall be rigidly braced to comply with the integrated equipment rating of the switchboard. The horizontal bus bars between sections shall be located on the back of the switchboard to permit a maximum of available conduit area. The end section is to have bus bar provisions for future addition of a switchboard sections. The provisions shall include the bus bars installed to the extreme side of the switchboard and prepunched to facilitate future bolted splice plates. The horizontal main bus bar supports, connections, and joints are to be bolted with grade 5 carriage bolts and Belleville washers to be free of required periodic maintenance. The switchboard shall have split bus sized and metered as shown on the Drawings.

D. Each switchboard, as a complete unit, shall be given a single integrated equipment rating to meet the available fault current as coordinated with the local utility company or a minimum of 65,000 amperes symmetrical fault current or larger as necessary conditions by the manufacturer. The integrated equipment short-circuit rating shall certify that all equipment is capable of withstanding the stresses of a fault equal to that of the least overcurrent protective device contained therein. Such rating shall be established by actual tests by the manufacturer on similar equipment construction as the subject switchboard. This test data shall be available and shall be furnished to the Engineer, if requested, with or before the submittal of approval Drawings.

E. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Equip each breaker with a circuit card holder and neatly printed card identifying the circuit. Tripped indication shall be clearly shown by the breaker handle taking a position between ON and OFF. The entire switchboard is to be Square D, I.T.E., Westinghouse or equal.

2.23 MOTOR WIRING

A. The Contractor shall do all wiring required for plumbing, ventilating and heating motors including mounting of switches and starters, as well as wiring of same. All wiring for the control of motors unless indicated on Electrical Plan, shall be provided under HVAC, Plumbing and Fire Protection.

B. The Contractor shall furnish and install horsepower rated disconnecting means as required by the National Electrical Code for all motors. Motor-driven equipment specified under "Plumbing" and "Heating and Ventilating" may be factory wired complete with controller and motor disconnects; the Contractor shall coordinate equipment purchased under these divisions so as to provide any necessary equipment. Motor disconnects shall be unfused unless noted otherwise. Single phase motor disconnects may be a thermal switch.

C. Each disconnect shall be clearly labeled with a screw fastened 1/4" engraved nameplate stating load controlled.

2.24 MOTOR STARTERS AND CONTROLS

A. Motors will be furnished and installed under the respective Sections of the Specifications under which the equipment is specified.

B. Motors 1/2 hp and larger will be 3 phase, 60 Hertz; motors less than 1/2 hp will be 120 volts, single, 60 Hertz, except specifically noted equipment.

C. All motor starters and controls unless furnished as an integral part of the equipment, shall be provided with suitable metal enclosures and shall conform with the NEMA Industrial Control Standards.

D. All motor starters shall have individual running overcurrent protection in each phase and shall be provided with two sets of auxiliary contacts. Starters for single phase motors shall be 2 pole and for 3 phase motors shall be 3 pole.

E. Manual starters shall be of the toggle mechanism type for full voltage starting. Magnetic starters shall be across-the-line type, minimum size NEMA 1 equipped with Hand-Off-Automatic switch.

F. Each motor starter and each control station shall be clearly labeled with screw fastened 1/4" engraved nameplate stating equipment controlled.

2.25 PRIMARY DISTRIBUTION SYSTEM

A. Furnish and install all conduit, as indicated on the Drawings. Excavation, backfilling, and concrete work for duct banks and manholes shall be furnished under another Section of the Specification.

B. Underground conduit encased in concrete shall be non-metallic type, standard wall conduit, or approved equal, unless otherwise noted on Drawings. Where non-metallic conduit is connected to rigid steel galvanized conduit, approved adapters shall be utilized.

C. First and last lengths, risers on pole, and all bends in underground duct system shall be made with rigid steel galvanized conduits.

D. Conduits shall be secured in duct bank with approved spacers and fastening methods to assure no movement during concrete pour.

2.26 SECONDARY ELECTRICAL SERVICE

A. Secondary electrical service shall commence at a secondary connection of utility company transformer.

B. Electrical Contractor shall furnish and install conduit, wire, compression connectors from the secondary connections at transformer to main breaker. Sizes of which shall be indicated on the Drawings.

C. Electrical Contractor shall furnish and install all metering equipment panels, switches and any other equipment shown on the Drawings or herein indicated to assure a complete working system.

2.27 NAMEPLATES

A. Nameplates shall be furnished and installed on all panelboards, pull boxes, cabinets, for all special purpose switches, motor disconnect switches, remote control stations, motor starters and other controls furnished under this Contract, to designate the equipment controlled and function.

B. Nameplates shall be laminated black bakelite with 1/4 inch high white recessed letters. Nameplates shall be securely attached to the equipment with galvanized screws or rivets.

Adhesives or cements will not be permitted.

2.28 SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS

A. The Electrical Contractor shall furnish and install all supplementary steel, channels, and supports required for the proper installation, mounting and support of all lighting fixtures and electrical equipment, to be installed under this Contract, as required.

B. All supplementary steel, channels, and supports shall be furnished, installed, and secured with all fittings, support rods, and appurtenances required for a complete support mounting system.

C. The type and size of the supporting channels and supplementary steel shall be determined by the Electrical Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with requirement for loading.

D. All supplementary steel and channels shall be installed in the neat and workmanship manner parallel to the walls, floor, and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

2.29 TELEPHONE UNDERGROUND CONDUIT SYSTEM

A. Furnish and install all conduit as indicated on the Drawings. Excavation and backfilling shall be furnished under another section of this Specification.

B. Lay conduits in trenches in true alignment and sloped for drainage. All conduit shall slope away from the building. Slope shall be continuous minimum of 3" in 100′ unless otherwise noted.

C. All conduits passing under roads, paved areas, and buildings shall be encased in concrete.

D. Materials: PVC Schedule 40 as manufactured by Carlon, in 10′ lengths, including all couplings and appurtenances necessary for laying in complete conduit line.

2.30 TELEPHONE SYSTEM

A. Backboards for telephone equipment shall be furnished and installed by this Contractor. Main backboard shall be dimensions indicated on the Plans. All backboards shall be painted both sides with fire resistant paint.

B. Telephone company shall furnish and install all equipment to Network Interface coated at the telephone backboard. The Electrical Subcontractor shall furnish all conduit and sleeves where required. The Electrical Contractor shall furnish and install all junction/bridge boxes, telephone jacks, outlets, and all wiring after network interface.

C. Residential unit telephone system wiring and devices shall be as follows:

1. Station wire, from the network interface at the telephone backboard, to the junction block in each tenant space, shall be; 3 twisted pair, 22 awg solid annealed copper, individually insulated with high density, color-coded PVC, and tough PVC outer jacket. Cable shall be ULCM and CMR rated, meet U.L. 444, NEC article 800 and IBM type 3 specifications. Station wire shall be 'Leviton' catalog number 43030. Color coded as follows:

Pair	Tip	Ring
1	white/blue	blue/white
2	white/orange	orange/white
3	white/green	green/white
4	white/brown	brown/white

2. Junction blocks shall be type 742B with terminal strip for connection of up to three extensions, using screws to terminate wires onto insulation displacement contacts. Unit shall also include cover and mounting screw. Unit shall be installed within the tenants entry area closet unless noted otherwise. Unit shall be made of the following materials:

   a. Jack housing: High impact, self-extinguishing plastic meeting U.L. Standard 94-V0 rating.

   b. Spring wire contacts: Phosphor bronze, plated with 50 micro-inches hard gold over 100 micro inches nickel.

   c. Wire leads: Polyester-insulated 26 AWG stranded copper.

   d. Screws and washers: Nickel-plated steel.

   e. Insulation displacement terminals: Tin-plated brass.

   Unit shall be Leviton Cat. No. 40219-I.

3. Wall phone jacks for wall mounted phones shall be type 630A, 4-conductor terminal jack, with ivory plastic faceplate.

   Leviton Cat. No. 40257-I.

4. Wall phone jacks for table phones shall be type 625B4 including 4-conductor modular jack, ivory plate and mounting hardware. Leviton Cat. No. 40249-I.

5. Quad station wire from junction block to individual telephone outlets, shall be; 4-conductor, 24awg solid annealed copper, individually insulated with high density, color coded PVC (red, green, yellow and black) cable shall include a tough, abrasion resistant PVC outer jacket and be ULCM and CMR rated, meet U.L. 444, and NEC article 800 specification. Quad station wire shall be Leviton Cat. No. 42330.

D. Commercial telephone system wiring and devices shall be as follows:

1. Station wire, from main backboard to individual outlets shall be 4 twisted pair, 22 awg solid annealed copper, individual insulated with high density PVC, and tough PVC outer jacket. Cable shall be UL CM and CMR rated, meet U.L. 444, NEC article 800 and IBM type 3 specifications. Station wire shall be Leviton Cat. No. 43040.

2. Wall phone jacks shall be 625B4 type including 8 conductor modular jack, ivory plate and mounting hardware. Leviton Cat. No. 40280-I

2.31 TELEVISION MASTER ANTENNA SYSTEM (Strip System)

A. SCOPE

1. The work includes furnishing and installing a television Master Antenna Distribution System complete and ready for use. The system shall include all antennas, antenna mast preamplifiers, mixer, amplifiers, power supplies, cable outlets, and all other parts necessary for the reception and distribution of the TV signal.

2. All equipment including antennas, amplifiers, filters, splitters, wiring, cabling, and outlets furnished and installed under these Specifications shall be the product of a single manufacturer and shall be guaranteed for a period of one (1) year from date of final acceptance thereof against all electrical or mechanical defects or failures,

except that which can be proven to have been caused by misuse. All service and parts shall be provided during the first year by the Contractor of this designated agent. Items of equipment which will be considered for equal as manufactured by CMC, Jerrold or Blonder Tongue have been listed; however, final approval will still rest with the Electrical Engineer.

3. In some areas reception quality and distribution require the use of specialty type items which are too numerous to detail in this Specification. The Contractor shall be responsible to familiarize himself with the site and to include in his price any such items required to meet the function imposed by this Specification.

4. All work performed under this section shall be periodically inspected by the equipment supplier and he shall be responsible for the correctness of the installation and use of all items furnished under this Specification. Final connections of all control components i.e. antennas, pre-amplifiers, filters, amplifiers, splitters, etc. shall be performed by a factory trained licensed technician employed by the distributor with a right to work as not to conflict with other jurisdictions or trades working on this project.

5. As part of this submission the distributor shall submit a list of no less than ten comparable installations he has installed and maintained over a period of no less than five years.

B. SYSTEM FUNCTION

1. The system shall receive the television signals by a set of antennas, amplify these signals and distribute these signals to all TV outlets to permit simple connection of EIA Standard television receivers. Channels 2, 4, 5, 7, 25, 38, 44, 56 & 68.

2. The system shall provide at all outlets the best signal reception that is equal or superior to that obtainable on the channels provided with individual outdoor antenna under the existing conditions.

3. The system shall deliver at all outlets monochrome and NICS color television signals without introducing noticeable effect on the intelligence and color fidelity.

4. The system shall be capable of simultaneous distribution of the VHF-UHF and sub-channel bands over a single cable. This shall be possible by

adding antennas, preamplifiers, power supply and any other equipment as requried. No additional or new conduit, active accessories, or distribution cable shall be necessary for the additional channels.

5. The system and all equipment shall be desigmed and rated for 24 hours a day continuous operation. All active components shall be solid state design; tubed equipment is not acceptable.

6. The system shall provide the specified reception and distribution quality for VHF channels common to the area, and UHF channels where closed circuit TV is specified it shall be distributed over unused VHF channels.

C. EQUIPMENT SPECIFICATIONS

1. VHF Antennas (channels 2,4,5 & 7)

    a. Antennas for use in master television distribtuion systems shall be of the wide spaced single channel yagi type to assure a flat signal response across each individual channel incorporated in a master system.

    b. These single channel antennas shall be impedance matched to 75 ohms to assure compatibility to the distribution system. Such impedance match shall be inherent in the design of the antenna and not achieved through the use of external baluns or matching transformers. The coaxial capacitors and connector assemblies for connecting the coaxial cable transmission line to the antennas shall be built on to the antennas, and fitted so as to accept RG-59/U or RG-11/U or similar 75 ohm coaxial cable.

    c. These signal channel wide spaced yagi type antennas shall be designed in spacing and length of elements to produce a flat signal response across the channel for which they are designed, yet have a sharp drop off of response to adjacent frequencies.

    d. Antennas for master systems shall be of heavy duty construction with element sleeving proportional to the length of the elements and manufactured of first quality high tensile strength aluminum.

    e. Booms and brackets shall also be manufactured from first quality, high tensile strength aluminum and so designed to assure perfect alignment of elements and positive locking of elements into position.

f. All aluminum parts shall be treated with a conductive corrosion protection surfacing.

g. Attachment of antennas to the mounting mast shall be affected by a double U-Bolt and saddle assembly to assure permanent, self leveling, no tilt mounting, and be able to accommodate masting up to 2" in diameter. Such U-Bolt and saddle assemblies shall be plated with a corrosion proof finish.

h. The construction of master system antennas and mounting shall be of sufficient strength to withstand loading from winds up to 120 mph under conditions of ice loading up to 1/4" in thickness.

i. Antennas and masts shall be electrically grounded and installed in accordance with sound engineering practices and conform to all applicable Codes and Regulations.

j. The antennas will be corrosion proof and vibration free, 1/2" seamless aluminum elements mounted to boom with stainless steel mounting hardware.

ELEMENTS:	5 Low Band 2 through 6 10 High Band 7 through 13
GAIN:	8 db Low Band 11 db High Band
FRONT TO BACK RATIO:	18 db Low Band 20 db High Band
IMPEDANCE:	75 ohms Low and High Bands
V.S.W.R. (Max)	1.35:1 Low and High Bands
LENGTH:	90" Average Low Band 96" High Band
WEIGHT:	8.5 lb average Low and High Bands

k. Furnish one for each VHF channel specified. Items considered for equal are: CMC-Y Series, Jerrold - J Series, Blonder Tongue - YH Series.

2. UHF Antennas (channels 25, 38, 44, 56, & 68)

a. All UHF antennas used in Master Antenna Distribtuion Systems shall be of the wide spaced broadband multiple drive yagi type to assure a relatively flat signal response across each channel incorporated in the system.

b. The UHF antenna shall be available in three different models with each model exhibiting maximum gain in one segment of the UHF spectrum, and in this segment the maximum signal response variation shall be no more than +_ 0.75 dB. However, each antenna shall also have broadband capabilities up to its highest designed channel, and in such broadband shall have a maximum signal response variations of +_ 3.7 dB.

c. The UHF antennas shall be impedance matched to 75 ohms to assure compatability to the distribution system. Such impedance shall be inherent in the design of the antenna through the use of stub tuned impedance transformer, and not achieved through the use of external matching transformer.

d. UHF anteannas for Master Antenna Television Systems shall be of heavy duty construction and the elements shall be manufactured of first quality high tensile strength aluminum .

e. Booms and brackets shall be manufactured from first quality high tensile strength aluminum and so designed as to assure perfect alignment of elements and positive locking of elements into position.

f. All aluminum parts shall be treated with a conductive corrosion protection surfacing.

g. Attachment of antennas to the mounting mast shall be affected by a double U-bolt and saddle assembly to assure permanent, self leveling, no tilt mounting, and be able to accommodate masting up to 2" in diameter. Such U-bolt and saddle assemblies shall be plated with a corrosion proof finish.

h. The construction of master system antennas and mountings shall be of sufficient strength to withstand loading from winds up to 120 mph under conditions of ice loading up to 1/4" thickness.

i. Antennas and masts shall be electrically grounded and installed in accordance with sound engineering practices and confrom to all applicable Codes and Regulations.

j. UHF antenna shall be heavy duty Yagi type cut from 1/2" diameter aluminum alloy drawn with a .049 wall. The elements shall be pre-riveted to the boom with brackets tamped from heavy gauge aluminum. Antenna booms shall be .06 wall high tensile strength aluminum, full 1 1/4 inch square for maximum rigidity. Boom and elements shall have fitted end caps of durable polyethelyne.

k. The antennas shall have an impedance of 75 ohms with preassembled "F" type coax connector providing a V.S.W.R. of under 1.5:1.

l. The entire antenna assembly shall be of GOLD corrodized construction and all connections made at the mast shall be stainless steel. The overall boom length shall be 89" with a total of 25 active elements, average gain shall be 14 db with a front to back ratio of 1/3:1. Provide one (1) for each channel specified Items considered for equal are: CMC - YU Series, Jerrold - J275*, Blonder Tongue - 4778*

3. Preamplifiers VHF-UHF

a. Preamplifier shall be furnished for each channel as required to meet the functions and picture quality standards outlined in this Specification. Each unit shall be solid state and utilize silicone transistor circuitry for maximum efficiency and minimum interference. Preamplifiers shall be remotely powered by the system amplifiers or remote power supply and meet the following:

	V_H_F_	U_H_F_
GAIN:	35 dB +_ 3 dB 6 MHz Bandwidth	
NOISE:	2.5 db Max.	4 dB Max.
INPUT MATCH (Return Loss)	14 dBRL	10dBRL +_ 3dBRL
TEST POINT:	-20 dB	
INPUT-OUTPUT:	75 ohm	
OPERATING TEMPERATURE:	-40 to 150 F	

WEIGHT: 3/4 lb.

b. Items considered for equal: CMC 7806-7807 Series, Jerrold 5200 Series, Blonder Tongue SCMA Series.

4. Equalizing Filters

a. Equalizing filters will be furnished covering all channels. Each unit will be self-contained in its own case and use high quality precision glass trimmers. Each filter will include two quality precision glass trimmers. Each filter will include two double tuned sections for excellent skirt selectivity; the VHF units shall include an attenuator with a continuously variable range as specified.

Frequency Range:	VHF Ch2-6 54-88 MHz	VHF Ch 7-13 174-216 MHz	Sub Ch.01-05 11-41 MHz	FM 88-108 MHz	UHF Ch.14-69 470-806 MHz
Bandwidth:	6MHz	6MHz	6MHz	20MHz	6.00MHz
Insertion Loss:	4dB	4dB	4dB	4db	3.5dB Max.
Skirt Selectivity +_ 9MHz fr.Ch. Center	28dB Min. 20db Min.	27dB Min. 20dB Min.	30dB Min.		
Attenuation Range Minimum:	15dB	15dB	15dB	15dB	12dB
AC-DC Power Passive:	NO	NO	NO	NO	NO
Impedance-Input and Output:	75 Ohms	75 Ohms	75 Ohms	75 Ohms	75 Ohms

Ambient Operating Temperature Range: -40F to +140F (All models)

Dimensions: Model 7813-7816 6 5/8" x 1 3/16" x 2 3/8"
Model 7494 8 1/4" x 13/4" x 3"

Mounting Models 7813-7816: Wall or base Mount (Model 7812)
Model 7494 Wall or 19" Rack Mount (Bracket model 7498)

Connectors: 75 Ohm "F" type Coaxial, supplied

Items considered for equal: CMC 7813-14-15-16-78, Jerrold GBC Series, Blonder Tongue BPF Series

5. AGC Strip Amplifiers

a. Single channel AGC controlled strip amplifiers shall be supplied for each channel designated. Each with a self contained power supply and a separate manual gain control. Each unit shall be of solid state design. The amplifiers shall be so designated that failure of any single transistor, rectifier, component will effect but one single "Off The Air" channel throughout the system. An automatic reset circuit breaker shall be provided to protect the individual amplifiers from shorts, overloads and high ambient temperatures. Each amplifier shall meet the following Specifications:

	V_H_F_	U_H_F_
GAIN:	54dB +_ 3dB compression	54dB +_ 4dB compression
OUTPUT CAPABILITY:	66dBmV(2 volts) for 1/2dB gain compression	67dBmV(2.25 volts) for 1/2dB gain compression
BANDPASS:	6MHz(Ch.2 thru 13)	6MHz(Ch. 14 thru 83)
BANDPASS FLATNESS:	+_ .5dB Both Models	
INPUT AND OUTPUT RETURN LOSS:	+_ 15MHz from band center:12 +_ 3dB All other:54 to 216 MHz:13 +_ 3dB	On channel:12 +_ 3dB Off channel to 33 MHz from band center:12 +_ 3dB All other:470MHz to 890MHz:18 +_ 3dB
AGC RANGE:	43 +_ 3dB	45 +_ 2dB
AGC STIFFNESS:	+_ 3/4dB output variation for an input level change of 40dB	+_ 3/4dB output variation for an input level change of 43dB
MAXIMUM INPUT SIGNAL	-10dBmV for a TASO grade 1 picture	-6dBmV for a TASo grade 1 picture
INPUT AND OUTPUT IMPEDANCE:	75 Ohms Both Models	
SKIRT SELECTIVITY:	-26dB min.at +_9MHz from band center	-32dB min.at +_21MHz from band center
POWER REQUIREMETNS:	100-130 Volts 60Hz 1.06 amps	
OPERATING TEMPERATURE:	-40 F to +150 F(-40 C to 65 C)	

SEMICONDUCTORS: 9 Transistors, 8 Diodes, 1 Zener Diode
11 Transistors, 8 Diodes, 1 Zener Diode

LINE CORD: 3 Wire/Grounding plug

WEIGHT: 2 7/8 lbs.

DIMENSIONS: 12 1/2"L x 5 1/8"W x 2 1/2"H

Items considered for equal: CMC 7800-7801, Jerrold THPM, Blonder Tongue HMCA

6. Amplified Accessories

   a. Line stretchers shall be used as required to assure the overall performance of the system. These line stretchers shall meet or exceed the following Specifications:

VHF GAIN: 15 +_ 1.5 db

UHF GAIN: 12 db at 890 Mhz

VHF OUTPUT CAPABILITY: 43 db mv

UHF INPUT: 43 db mv

TILT CONTROL: 5.5 db tunable VHF
3.5 db Fixers UHF

POWER REQUIREMENTS: 17 VDC, 24 ma

MODELS: Signal extender V & U

   b. The self contained UHF-VHF reamplifiers shall meet the following:

FREQUENCY RANGE: 54 to 108 MHz, 174 to 216 MHz,
470 to 806MHz

BAND:	VHF	UHF
GAIN, MINIMUM:	27 dB	27 dB
MAXIMUM INPUT SIGNAL PER CHANNEL: *	27dBmV(2 Ch) 21dBmV(5 Ch) 19dBmV(7 Ch)	25dBmV(2 Ch) 19dBmV(5 Ch)
GAIN CONTROL RANGE, MINIMUM:	Low Band 10 dB, Hi Band 10 dB	10 dB
NOISE FIGURE:	8 dB	11 dB

OUTPUT CAPABILITY, MINIMUM PER CHANNEL*:	54dBmV(2 Ch)	52dBmV(2 Ch)
	48dBmV(5 Ch)	46dBmV(5 Ch)
	46dBmV(7 Ch)	

FM BAND REJECTION SWITCH: 20 dB Minimum (95MHz to 108MHz)

IMPEDANCE, INPUT & OUTPUT: 75 Ohms

AMBIENT OPERATING TEMPERATURE RANGE: -40 F to +140 F

POWER TO INPUT TERMINAL: Minus 20 VDC

POWER REQUIREMENTS: 105-129 VAC 60 Hz 14 Watts

CABINET, COLOR, FINISH: Steel, Gray, Baked Enamel

DIMENSIONS, CABINET WITH BASE PLATE: 11-1/8" x 5 2/4" x 2 3/4"

CONNECTORS: Standard "F" Type Coaxial, Supplied

Items considered for equal: CMC 7330B, Jerrold IDA45, Blonder Tongue CUVB 54P

7. Line Splitters

a. Line splitters shall employ high quality hybrid circuitry, for superior isolation between outputs. Splitters shall accept and equally divide incoming signal on a single cable into several (two or four) branch lines. Splitters shall be encased in a zinc die cast housing with built-in grounding screw and meet the following:

FREQUENCY RANGE: 5 MHz to 900 MHz

TYPE:	2 Way	4 Way
INSERTION LOSS		
VHF NOMINAL	3.5 dB	6.5 dB
UHF NOMINAL	3.8 dB	7.0 dB
RETURN LOSS, MINIMUM:	20 dB	20 dB
ISOLATION BETWEEN OUTPUTS, min.	25 dB	25 dB
AC/DC POWER PASSIVE:	Yes	Yes

IMPEDANCE, ALL TERMINALS: 75 Ohm

HOUSING: Zinc, Die-Cast

COLOR, FINISH: Silver, Nickel-plated

DIMENSIONS: 2" x 2 3/8" x 3/4" x 3" x 2" 3/4"

a. Items considered for equal: CMC 7943-44, Jerrold SWS-2UV-4UV, Blonder Tongue 7612-13.

8. Outlets

a. Outlets for each location as shown on Plans shall be standard duplex type receptacle furnishing one "F" type connector to accept cable as further specified. Each outlet shall provide variable tap isolations of 12, 17, or 23dB by way of slip out resistors. Through line connections on the rear of the outlet shall be of "F" type and the last outlet of each riser shall be equipped with a terminator. Isolation and through line losses shall not exceed the following:

FREQUENCY RANGE: 10 MHz to 890 MHz

MODEL:	7823	7824	7825
ISOLATION:	23 dB	17 dB	12 dB
INSERTION LOSS, MAX			
VHF	.4 dB	.8 dB	1.0 dB
UHF	.4 dB	.6 dB	.8 dB

RETURN LOSS MINIMUM		
THRU LINE, ALL MODELS	18 dB VHF	15 dB UHF
TAP PROT, ALL MODELS	18 dB VHF	15 dB UHF

IMPEDANCE, THRU LINE: 75 Ohm

CONNECTION, THRU LINE: "F" Type Coaxial

AC/DC POWER PASSIVE, THRU LINE: Yes

AC/DC POWER BLOCKED, TAP: Yes

TAP IMPEDANCE AND CONNECTION: 75 Ohm, "F" Type Coaxial

COLOR: Ivory

DIMENSIONS: Fits standard Electrical Wall Box

HARDWARE: 2 Mounting Screws, Supplied

b. Items considered for equal: CMC 7823, Jerrold UT82, Blonder Tongue V3158.

9. Set Cables and Transformers

   a. The Contractor shall furnish for each outlet shown on Plans a ten foot section of coaxial cable terminated at either end with "F" type connectors to mate with the specified outlets. For connections to the television receiver each cable shall be furnished with a combination 75 to 300 ohm pig tail connector cables clearly marked as to installation instructions. Items considered for equal: CMC 7283, Jerrold FSX-1314-FM, Blonder Tongue BS300U-V.

10. Distribution Cabinet

   a. Supply at head end location as indicated on the plans a well ventilated metal cabinet, complete with a locking door, suitable to house all amplifying equipment and accessories. As herein specified, the cabinet shall be constructed of 16 gauge crs. with 11 gauge bottom panel. The rack shall accommodate 19" rack panels and any unused areas shall be filled with blank panels. The cabinet shall allow for either front or rear servicing by way of a double hinge at both the front and rear. The cabinet submission shall include complete mounting arrangements of all equipment contained therein and include a ten position power panel. Items considered equal: CMC 2100, Jerrold EH40 with lock, Blonder Tongue 1942 bF and C.

11. Terminations

   a. All outlets at the end of each line and any unused inputs shall be properly terminated as per manufacturer's recommendations. Items considered for equal: CMC 7190, Jerrold TR75F, Blonder Tongue BTF-TP.

12. Cable

   a. All cable shall be 82 channels 75 ohm type. Size of coaxial cable shall be determined by system layout. All cables shall be run in continuous lengths except for terminations and no splices shall be permitted within any conduit run. Cables shall be installed to avoid sharp bends or physical distortion. The center conductor shall be copper with a foam dielectric. Mainline cable RG6 type. Cable from antennas to distribution cabinet and mainline shall be RG11/U CAC6-CAC11, Blonder Tongue FAVC-6 FAVC-11.

13. Modulator

A modulator shall be furnished to convert the video lobby camera to RF. The modulator shall be as follows and include an amplifier and related accessories as previously detailed in this Specification.

Input Impedances: Video-75 ohm "F

Audio Input Level: +10 dbm nominal

Output Impedance: 75 ohm "F" Connectors

Video Carrier Output: 33 dbmc nominal

Audio Carrier Output: 23 dbmv nominal

Video Carrier Frequency Accuracy: ± .005%

Video Response: Flat (± 1 db) to 4.2 MHz; 20 db down 4.5 MHz above and 1.5 db below video carrier

Differential Gain at 3.5 MHz (color sub-carrier): Less than 5% (Black to white) to at least 75% modulation

Differential phase at 3.5 MHz: Less than 5% (Black to white) to at least 75% modulation

Video/Audio Carrier Separation: 4.5 MHz ± 5 KHz

Audio Carrier Deviation: ± 25 KHz = 5 KHz

Audio Response: 20 to 7500 Hz: +0,-3db to 75 u dec pre-emphasis

750u Hz to 155 KHz: +0, -5 db

Audio Distortion: Less than 2%, 20 Hz to 15 KHz

Temperature Range: 0 to 50 C

Power Requirements: 105 to 125 VAC, 56/60 Hz; 1.5 watts

Dimensions: 12-1/8"L x 5"W x 2-1/16"H

Items considered for equal: CMC 7804, Jerrold UM, Blonder Tongue AVMTa

D. OMISSIONS AND TESTS

All fittings, pads, terminations, filters, trap, etc. needed to provide the best performance possible will be considered required. All data sheets for such shall be shown in the submittal.

On completion of the installation of the system, the Contractor supplying this equipment shall provide a qualified technician with a calibrated field strength meter and a television receiver to show the quality of reception and verify signal strengths to the satisfaction of the Engineer and/or his authorized agent.

2.32 FIRE ALARM SYSTEM

A. General

1. General Requirements

   a. Comply with Division 1, General Requirements and documents referred to therein.

   b. Provide all labor, equipment, and materials to complete the Life Safety Fire Alarm System work in accordance with local and state regulations.

2. Description of System

   a. The Life Safety Fire Alarm System shall be a zoned, non- coded,electronically supervised, microprocessor based system as manufactured by Edwards. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using an integral service console or plug in programmer.

   b. Provide smoke and fire detection, sprinkler supervision, and automated single stage evacuation control. Interface to environmental controls and auxilliary devices.

   c. Provide signal appliances and signal controls for the safe and orderly evacuation of the building.

   d. The Life Safety System shall generally consist of the following main components:

      - control center

Locate the main components and all related devices as shown on the plans.

3. Automatic Alarm Operations

   a. Operation of an alarm input device shall turn on the respective red zone alarm LED on the control panel.

   b. Operation of an addressable or conventional alarm input device shall flash the alarm queue LED, sound a momentary audible signal, and annunciate on the alphanumeric LCD display. Display the type, condition, and a location message for the first alarm immediately without the need for operator response. Capture the display to annunciate an alarm in the event the shared display is annunciating events of a lower priority or is in the site programming mode. Turn on a respective red individual zone alarm LED at the control panel.

   c. Sort new (subsequent) events by type and log into type queues for display by emergency user selection. Sound a momentary audible signal for each event occurrence. Flash a queue LED when an unseen event exists in a queue. Update the display to annunciate the total by type and the chronological number of the event on display i.e. 3 alarm reports - #2 displayed.

   d. Activate the City Tie Connection.

   e. Sound the evacuation signals on the floor in alarm, the floor above, and the floor below.

   f. Sound an alert signal on all zones not sounding evacuation.

   g. Do not program signal tones on the stairwell paging circuits.

   h. Display the operational status of each signal circuit to inform the emergency user of the system signal programming. Fast flash the green status LEDs for evacuation. Provide slow flash for alert, and turn the LED on steady during paging.

   i. Start a 60 second alarm silence inhibit timer to prevent the silencing of alarm signals by any means for the first 60 seconds. this feature may be de-selected in the programming mode for testing purposes.

j. Start an automatic alarm signal silence timer to silence all the audible alarms 10 minutes after the last alarm event. Recycle this timer for each alarm event. Turn on an alarm silenced LED while the signals are in the silence mode. Should a new alarm occur on a different zone after signal silence the alarm devices shall resound.

k. Shutdown air supply fans and start pressurization and smoke exhaust fans as required and shown on drawings.

l. Open smoke exhaust dampers serving the fire zone.

m. Open main smoke exhaust dampers downstream from the fire zone.

n. Open supply dampers on the floor above and below the floor of incidence.

o. Home the elevators to the ground floor. If the ground floor is in alarm home the elevators to the alternate floor.

p. De-energize door holders to release fire doors.

4. Emergency User Controlled Operations

a. Operation of the Silence Alarm Signals push shall silence all alarm signals. Turn on an alarm silenced LED while the signals are in the silence mode. Should a new alarm occur on a different zone after signal silence the alarm devices shall resound. This feature is subject to the 1 minute inhibit feature.

b. Operation of the Sound Total Evacuation push shall turn on the evacuation LED and sound all signals at the evacuation rate.

c. Operation of the Enable Zone Evacuation push shall place all signal circuits under manual control. Turn on a related LED while the feature is active. This feature prevents accidental or premature evacuation of a zone or group of zones during emergency conditions.

Subsequent operation of a signal or signal/page zone push shall deliver the evacuation signal to the selected zone(s). Turn on a related red LED for each zone receiving the evacuation signal manually or automatically.

d. Operation of the Cancel Automatic Evacuation push shall cancel the automatic evacuation timer. The cancel automatic evacuation timer LED turns on steady amber.

e. Operation of the Silence Operator Alert Signal push shall turn off the operator alert signal. The amber status LED follows the signal operation.

f. Operation of the Replay Alarm Sequence push shall turn all alarm LEDs off. The system then turns them on again in the sequence the alarm occurred.

g. At the LCD Common Control/CPU, operation of a queue select key (alarm, supervisory, trouble, and monitor) will display the first unseen event in a queue.

h. Operation of the next message key will display the next event logged in a queue. Operation of the next message key when the last event is on display will scroll the display to the first event.

i. Operation of the previous message key will display the previous alarm event logged in the alarm queue of the LCD display.

j. Operation of the Enable Page Zone push enables all individual page zone select switches. This feature prevents accidental or premature paging to a zone or group of zones during emergency conditions.

k. Operation of a zoned or grouped page select push shall select signalling zone(s) for paging. Turning on related green zone select LED(s). Maintain the signalling to the selected zone(s) until operation of the microphone "press-to-talk" (PTT) push. Operation of the PTT push shall connect the selected circuits to the paging channel. Inform the emergency user of the connection by turning the circuit status LED on steady. Automatically deliver a pre-announce tone for three seconds after PTT operation. Turn on an amber preannounce tone LED during preannounce tone delivery. Inhibit a subsequent delivery of the preannounce tone if the PTT push is flashed. Maintain all signalling operations to nonselected zones during a paging operation. Automatically restore alarm signalling to selected zones three seconds after the PTT push is released.

l. Operation of the Page To All Zones push shall select all zones for paging and turn the LED On steady green. A subsequent operation of Page To All Zones or Cancel Page Selections push shall terminate the paging operation.

m. Operation of the Page To Alert Zones selects all signal/page zones programmed to the alert signal for paging. The LED turns ON steady green.

n. Provide automatic page deselect after 1 minute if paging is not active and page switches are not selected.

o. A call from a remote telephone handset shall sound a tone at the remote handset, flash the common green call-in LED, the green zone indicator LED, and an audible signal. Lifting the master handset shall silence the call-in signal, turn the call-in LED on steady and automatically connect the call.

p. Automatically connect subsequent calls immediately and turn the zone LED on steady. Up to five remote handsets may be on line simultaneously before any signal degradation occurs. Any call may be disconnected by operation of the telephone privacy push and the zone select push.

q. Operating the Telephone Privacy push enables the following zone answering sequence.

r. Replacing a remote handset will automatically clear the call-in selection. The emergency user need only hang up the master handset to restore the system to normal.

s. Operation of the Page By Phone push will turn on a related LED and make any active telephone zone the primary paging source and allow the master handset to monitor the page message.

t. Sound a trouble within 10 seconds if: the master handset is off-hook, page by phone is not active, and no remote handsets are placing a call.

5. Non-Emergency User Operations

a. Log a trouble and turn on a related LED for all user features which modify, bypass, or inhibit the normal operations of the fire alarm life safety system. Suppress the common trouble signal during delivery of alarm signalling.

b. Operating the Disconnect City Tie push shall prevent operating the City Tie module. Operation of the disconnect push shall also bypass operation of all auxiliary relays for test purposes. This switch may be disabled when required by local authorities.

c. Operating the Disable All Auxiliary Relays push isolates all auxiliary relays from the system program. It shall not affect relays already under manual control. Operation of the disconnect push shall also bypass operation of all auxiliary relays for test purposes.

d. Operation of the Sound Fire Drill push shall cause all signals to sound evacuation. The City Tie module and auxiliary relays shall not operate.

e. Operation of the Enable Zone Disconnect push shall enable all individual zone disconnect switches and sounds the operator alert signal. The LED turns On steady Amber. Subsequent operation of a zone disconnect switch isolates the respective zone from the system software. The circuit status is monitored while disconnected to prevent inadvertent or accidental reconnection causing building evacuation during preventative maintenance procedures. Systems without this feature shall be unacceptable.

f. Operation of the Test All Lamps starts the lamp test sequence. The lamp test sequence test all display module and remote annunciator LEDs.

g. On the LCD CPU, operation of the display ID code key shall annunciate the channel number and address of the currently displayed device.

h. Operation of the menu key shall call a smart prompt program to guide the user through LCD CPU programming operations. Restrict the use of this program by password.

i. Operation of the Reset System push shall return the system to normal after all initiating devices have been returned to normal.

6. Supervisory Operations

a. Operation of a normally open or normally closed supervisory input device shall turn on the respective amber zone alarm LED on the control panel and at the remote annunciator. Activate the common trouble sequence if no fire alarms are active.

b. Operation of an addressable supervisory input device shall flash the supervisory queue indicator, sound a momentary audible signal, and display on the alphanumeric shared display. Display the type, condition, and a location message for the first alarm immediately without the need for operator response if no fire alarms are present. Log subsequent supervisory events in the supervisory queue for display by emergency user selection. Also display the current total number of supervisory events and the chronological number of each event. Provide supervisory alarm priority to capture the display from a trouble or monitor event. Turn on a respective amber group individual zone LED at the control panel and at the remote annunciator.

7. Quality Assurance

a. Install in accordance with the National Electrical Code.

8. Submittals

a. Submit shop drawings for the control panel, annunciator and devices.

b. Submit custom operational sequences for the emergency communications, peripheral devices and fire alarm common controls.

c. Submit pictorials or photographs of control equipment overviews, modular components, and interconnecting cable charts.

d. Provide system manuals, maintenance instructions and the name, address, and 24 hour telephone number of the service department of the SYSTEM SUPPLIER.

e. The Electrical Contractor shall provide as built floor plans showing all devices, control panels, and connections to mechanical equipment. Drawings shall show all conduit routing and sizes, all wire sizes, types, and numbers.

9. Replacement of Defective Items

   a. Supply to the Architect a written agreement from the equipment manufacturer to supply new components to replace defective items without cost to the Contractor, where such defective items become evident during a period of one year from the approved certificate of completion.

B. Products

1. Manufacturers

   a. The material specified is as manufactured by Edwards. The quality implied includes their strong local Sales and Service support.

   b. The contractor shall base his bid on the equipment specified.

   c. Alternate suppliers may be Simplex, Honeywell and Pyrotronics. Substitution of products implied to be equal will be considered only if a complete list of such manufacturers entered products supported with complete documentation is submitted to the consultant 10 days in advance of closing.

2. Control Center

   a. Provide Edwards ESA2000 control center in compliance with U.L. requirements.

   b. Locate fire alarm and emergency communication common controls in the same cabinet for convenient use. Use modular components.

   c. The system shall be housed in a surface wall mounted Fire Red cabinet with a door and viewing windows as required. All annunciator indications, operating controls and instructions shall be clearly visible through the viewing window. The door shall be complete with a lock and two keys.

   d. All electrical connections shall be front accessible through the hinged inner door.

   e. Provide an integral service console which allows qualified service technicians to complete the following operations:
      - enable/disable system options.
      - configure a remote annunciator.
      - set periods for various system timers.
      - set evacuation signal rate.

- program relays and signals.
- set system time and date.
- Verification Test.

f. The service console shall provide system activity LEDs and event buffer display.

g. The single person installation verification test shall allow silent and non silent testing of all system components. In addition it shall produce a detailed report listing relay and signal programming for each verified input.

h. Provide the ability to use a Plug In Field Programming Tool/Diagnostics Tool. This tool shall allow a qualified service technician to perform multiple level programming, detailed system diagnostics and print system summary reports.

3. Addressable Loops (Circuits)

a. Connect addressable circuits to an Edwards 2010 Series Loop Controller. Each control panel shall be capable of supporting up to 800 addressable devices. Provide addressable modules capable of supporting up to 100 devices. Use twisted pair wire. Connect addressable loops Class A (Style 6). Class B wiring shall not be acceptable.

b. Each addressable device shall have a unique address. The manufacturer shall program each address to a system input zone and correlate to output operations per the plans and this specification. Non-functioning, non-addressed and non-programmed devices shall report trouble. Provide for site modification to the addressable programming. Provide for removal of devices without the necessity of re-addressing any other devices. Provide installation flexibility to the contractor by insuring that the physical sequence (placement) of the devices on the loop need not determine the device address.

c. Address and connect addressable alarm receiving devices to the addressable loop as recommended by the manufacturer. The manufacturer shall provide installation tables to identify all device addresses.

d. Connect each normally open sprinkler supervisory device to a dedicated addressable transponder. Annunciate each supervisory addressable input device alarm or trouble operation on the LCD. Provide an individual status LED for each supervisory device.

e. Provide circuits to monitor auxilliary devices such as smoke dampers and fan operation as shown on the plans. Annunciate open or on states as required. Provide an individual status LED for each circuit and display a message on the LCD display.

5. Signal Appliance Circuits

a. The Output Module shall be an Edwards 2002 module. It shall provide two power limited circuits, field programmable for any of the following operations:
- Audible or Visual signals controlled by signal silence.
- Audible or Visual signals controlled by system reset.
- Remote auxiliary devices which DO or DO NOT operate in the degraded mode.

This shall be determined upon field requirements and be selectable during programming.

6. Signal Page Circuits

a. Signal/Page circuit shall be an Edwards 2006 Series module.

b. Provide a zoned amplifier configuration capable of 3 simultaneous signals.

c. Provide power limited audio signal circuits for each evacuation zone. Provide a paging select push and an LED for each circuit. Connect Class "B". There shall be two circuits per floor. Alternate adjoining system speakers between circuits. During alarm conditions continue to operate into circuits with open faults in order to deliver the signal/page message at all possible locations.

d. Provide automatic channel selection for each audio signal circuit. System programming shall connect the circuits to either the evacuation or alert channel.

e. Provide a dedicated amplifier for each circuit capable of delivering power 50% greater than the circuit load. Protect amplifiers from short circuit fault damage. Supervise the amplifier output for a loss of no more than 6 db. Failure of a single amplifier shall not affect the operation of more than one split circuit. Automatically switch any circuit with a failed amplifier to a standby amplifier.

f. Allow a 4 watt load for cone speakers.

g. Allow an 8 watt load for re-entrant horn speakers.

7. Auxiliary Relays

a. Auxiliary relay module shall be an Edwards 2002 Series module with four "1C" site programmable relays.

b. Provide auxiliary relays with push switches and status LEDs to control auxiliary functions as listed in the operations and as shown on the plans. Relays shall be dust tight with fuse protected contacts rated at 24 VDC/120 VAC, 2.5 amps. inductive at a .35 power factor. To decrease the time required for installation verification, Each relay will have a follower LED which verifies operation of the relay.

8. City Tie Module

a. Provide an Edwards 2010 Series City Tie (Fire Department) Module The system shall support multiple City Tie modules.

b. Program the module to operate upon activation of an alarm, OR supervisory.

c. Each module shall be field programmable to provide one of the following outputs:
- Remote Station.
- Reverse Polarity.
- Local Energy Municipal Box.
- Shunt ("1C" alarm contacts) The reverse polarity output must meet NEMA Standard SB3-1968

9. Fire Alarm Common Controls and CPU

a. Common Control/CPU shall be an Edwards 2025 Series module. The CPU shall be self configurable and able to map to the display module by I/O module type. It shall have built in field programmable software capable of being programmed and configured on site using either the built in service console or a plug in programming tool.

b. Provide an LCD CPU/Common Control Module with a 2 line 40 character LCD display and 16 Membrane switches for common control and programming functions.

c. Universal Display modules with 8 Tricolored LEDs and 8 Membrane switches shall connect to the CPU and provide all zone annunciation and/or control functions. A slide in designation label shall provided to simplify changes to zone designations and language.

d. Provide the following common control switches and indicators: Alarm/City Tie Operated LED, Common Trouble LED, Power ON LED, Sound Total Evacuation Switch and LED, Enable Zone Evacuation Switch and LED, Enable Zone Disconnect Switch and LED, Alarm Replay Sequence, Disable All Auxiliary Relays, Standby Power Trouble, Test All Lamps, Silence All Signals, Silence Operator Alert Signal, Silence Alarm Signals, Cancel Automatic Evacuation, Sound Fire Drill, Sound All Clear, Disconnect City Tie, Annunciator Trouble, Ground Fault, Reset System.

e. Provide the following optional features: supervisory City Tie operated LED, common alarm LED, alarm signal silence inhibit LED

f. The LCD CPU/Common Control shall provide the following: Alarm/City Tie Operated LED, Common Trouble LED, Power ON LED, Sound Total Evacuation Switch and LED, Ground Fault, Standby Power Trouble, Test All Lamps, Silence Alarm Signals, Silence Operator Alert Signal, Silence Alarm Signals, Drill, Disconnect City Tie, Ground Fault, Reset System. In Addition the LCD CPU/Common Control shall provide the following: Alarm Queue Switch and LED, Supervisory Queue Switch and LED, Trouble Queue Switch and LED, Display I.D. Switch, Programming Menu Switch, Cancel Switch, Previous Switch, Next Switch, Enter Switch. These switches provide operator interface to the system software and function as programming keys.

The Liquid Crystal Display (LCD) shall be of the supertwist high contrast type providing two lines by 40 characters. Provide non-interleaving event display by type sorting input events into queues. Types shall be fire alarm, supervisory alarm, trouble, and monitor. Provide a LED for each queue to indicate the presence of events. Provide queue select pushes to allow user selection of the event type to display. Provide previous and next pushes to allow scrolling through a list of events. Provide a full alpha-numeric keypad to support site programming. Use a smart menu scheme to guide the user through programming sequences. Initiate trouble if programming input is incomplete.

10. Fire Alarm Zone and Circuit Controls

    a. Provide the necessary quantity of:

        1. Zone annunciation for fire alarm, supervisory, and monitor receiving circuits. Annunciate circuit active and trouble individually.

        2. Provide circuit disconnect and test for fire alarm, supervisory, and monitor receiving circuits. Provide a zone LED dedicated to the disconnect function.

        3. Zone evacuation control selection. Annunciate evacuation signalling by zoned red LEDs. Lock on the LED for either automatic or manual evacuation signalling to provide an annunciated "memory" of evacuated areas.

        4. Zoned auxiliary relays to interface with the HVAC, elevator, and door controls per the operation and plans. Provide a manual control push and status LED for each relay.

11. Emergency Communication System

    a. Provide the following Common Controls: Page To All Zones, Page To Alert Zones, Page To Evacuation Zones, Enable Page Zone Selections, Cancel Page Zone Selections, Telephone Call In, Telephone Privacy, Page By Phone.

    b. Provide the following optional features: page in use LED, page inhibited LED, group page switches.

12. Alarm Signalling

    a. Provide a fire appliance signal source at 120 strokes per minute, a 3-3-3 temporal pattern, a continuous rate for evacuation. Provide a 20 spm rate for alert. All rates to be selectable as required.

b. Provide a CODE 4 electronic bell tone followed by a pre-recorded Female message for evacuation. Message shall conform to local code.

c. Provide an Edwards 2006 Series programmable tone module. It shall be field programmable for any one of 9 tones.^ 1000 Hz^^ slow whoop^^ fast whoop^ ^slow siren^ ^fast siren^ ^beep^ ^shutter^ tone^ pulsed at^^ 120 bursts per minute^^ temporal code 3-3-3^^. Program for slow whoop. System software shall select alert or evacuation tones as required. Tone modules may be used as primary or standby tones for other signal sources. Provide a 4 bit frequency adjust switch to allow custom tone frequencies defined by this project.

d. Provide an Edwards 2006 Series Digitized Voice Repeater panel. The digitized voice repeater shall store messages in permanent EPROM memory. Provide multiple Digitized repeaters for evacuation signals.

13. Signalling and Emergency Paging Integration

a. Provide alarm tone signalling and emergency paging as an integral part of the Life Safety Fire Alarm System. "Add on" paging systems are not acceptable. The system CPU shall control automatic signalling, read the audio controls, and annunciate signal selection and operation status.

b. Provide tri-channel evacuation, alert and page signalling. Paging operations shall not interrupt either alert or evacuation signalling in areas not selected for paging.

c. Supervise all signal tone and emergency paging signal paths.

d. Provide a master microphone with a push-to-talk (PTT) push, dynamic noise cancelling, and a frequency response from 200 to 4000 Hz. Provide 4 feet of coiled expansion cord.

14. Emergency Telephone

a. Provide a two-way emergency fire fighters communication system as an integral part of the Life Safety Fire Alarm System. "Add on" telephone systems are not acceptable. The system CPU shall annunciate/control circuit status and control automatic answering. Supervise all telephone signal paths.

b. Provide a red master handset at the control panel with 10 feet of flexible coiled extension cord. Provide an audible call-in signal and LED.

c. Up to 5 remote handsets may connect to the master before any signal degradation takes place.

15. System Supervision

a. Hardware or software fault detection shall activate the audible and visual trouble indicators. Operation of the trouble silence push shall silence the audible signal, but the LED shall remain on. A new fault shall resound the signal. It shall not be possible to turn off the trouble LED until the system is clear of all faults. The common trouble circuit operation shall be independent of the CPU.

b. Trouble Reporting

1. All by-pass conditions such as auxiliary or fire department by-pass.

2. All wiring to all fire alarm devices.

3. All control panel hardware for placement.

4. All software routines and all program data for change.

5. All volatile memory for failure.

6. Primary and secondary power.

7. All field wiring for ground faults of 65 Kohm or less.

8. Maintain a record in memory of fault events. Identify faults by code to simplify service trouble shooting. Standard system reset shall not erase this record.

16. System Power

a. Provide primary operating power of 120 Volts A.C. 60 Hz. Use modular no-break system power supplies with integral battery chargers battery chargers capable of recharging within 12 hours.

b. Provide supervised secondary battery power to operate the entire system for 60 hours under normal conditions. At the end of 60 hours, the standby source shall power the system under alarm conditions for 10 minutes. Calculate the signal/page circuits alarm load at a 25% duty cycle.

c. Isolate the audio amplifier power (primary and standby) from all other control panel power. Use modular no-break system power supplies with integral battery chargers battery chargers capable of recharging the standby batteries to 80% capacity within 12 hours.

d. Provide a separate power source for auxilliary devices. Allow for a separate utility supply. Faults on auxilliary circuits shall not interfere with the operation of the life safety system.

17. System Protection

a. Provide high voltage transient protection on all circuits. Minimum protection shall be 1000V for alarm receiving, 1500V for signalling, and 2500V for power supplies.

b. Protect sensitive electronics subject to static damage. Installer access to areas with static sensitive parts shall not be necessary.

c. Protect controls and annunciation behind locked doors all keyed alike. Provide door windows to allow viewing of all common controls.

18. Analog Addressable Devices

a. Provide Edwards 6270B-200 Analog Addressable Photoelectric type smoke detector as shown on the contract drawings.

b. Provide Edwards 6251B-200 Analog Addressable sensor base as shown on the contract drawings.

c. Provide Edwards 6251B-R100 Anaolg Addressable sensor base with auxilliary contacts as shown on the contract drawings.

d. Provide Edwards 6266B-200 Anaolg Addressable Photoelectric type duct smoke detector as shown on the contract drawings.

e. Provide Edwards 6294B-100 Anaolg Addressable heat detector base for use with Edwards 290 series heat detectors as shown on the contract drawings.

f. Provide Edwards 6296B-100 Anaolg Addressable manual station transponder for use with Edwards pull station # 278-1110 as shown on the contract drawings.

g. Provide Edwards 6297B-200 Anaolg Addressable contact zone transponder for use with any

normally open contact device as shown on the contract drawings.

h. Provide Edwards 6297B-300 Anaolg Addressable monitor module where Fire Alarm monitoring functions are required; as shown on the contract drawings.

i. Provide Edwards 6298B-R100 Anaolg Addressable control relay module where auxilliary functions are required as shown on the contract drawings.

ALARM HORNS

a. Use red fire alarm horns of the enclosed mounting type with heavy duty mechanisms to provide 87 dB @ 10 feet. Polarize the horns for supervised operation. Use flush, grill, and/or surface mounting as indicated on the plans. Provide weatherproof wallboxes for outdoor mounting.

STROBE UNITS

b. Use wedge shaped strobes clearly labelled Fire. Polarize the strobes for supervised operation. Strobes shall provide a high intensity flashing light (100K Lumens) for visual signalling. Mount the units flush or surface as indicated on the plans.

COMBINATION UNIT

c. Use combination type horn strobe units where indicated on the plans. Units shall be polarized for supervised operation. Horns shall be rated at 90db @ 10 ft and be UL listed for fire alarm indicating appliances. Edwards 892-2B-001.

d. Use combination type speaker strobe units where indicated on the plans. Speakers shall have taps of 1/2 watt, 1 watt, 2 watts and 4 watts. Edwards 896B-001

AUDIO DEVICES

22. Signal Paging Devices

CONE SPEAKERS

a. Use 4 inch eight ohm Re-Entrant type loudspeakers with matching transformers parallel connected to supervised 70 volt signal/page circuits. Provide input power taps (1/2,1,2,4 watts) and factory set to 1 watt. Provide axial sensitivity of 87db at 10 feet for a 1 watt input over a frequency range of 50 to 13000 Hz. Provide a RED baked enamel finish. Provide flush mounting in finished areas.

RE-ENTRANT SPEAKERS

b. Use eight ohm re-entrant horn speakers with matching transformers parallel connected to supervised 70 volt signal/page circuits. Provide input power taps at, 2, 4, 7.5,15 watts. Provide axial sensitivity of 92 db at 10 feet for a 2 watt input over a frequency range of 400 to 4000 Hz. Mount flush or surface as shown on the plans. Edwards 895B-001

23. Telephone Devices

PERMANENT FIREPHONES

a. Use red remote telephone handsets housed within a locked breakglass enclosure. Provide a red finish. Clearly mark the housing with "FIRE FIGHTERS TELEPHONE" in large letters for easy identification. Provide flush or surface mounting as shown on the plans. Edwards 6830-1

24. Auxilliary Devices

a. Use remote control relays connected to supervised auxilliary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be 5 amperes at 120 VAC resistive or 2.5 amperes at 120 VAC inductive for a .5 power factor.

b. Use wall and floor mounted door releases rated at 120 VAC EDWARDS 1504 SERIES

25. Local Smoke Detectors

    a. Individual units shall be provided with single station photoelectric smoke detector, Gentex model 710CS, located as indicated on the plans. In units where more than one detector are indicated, units shall be wired in tandem.

26. Manual Pull Stations

    a. Furnish and install where indicated on the plans Edwards 278B-1110 double action manual stations with screw terminals for connection of installation wiring.

27. Heat Detectors

    a. Furnish and install where indicated on the plans, Edwards 290 series heat detectors. Detectors shall plug into standard smoke detectror bases or analog addressable heat detector bases as required.

293B	135 degree fixed tepmerature
294B	194 degree fixed temperature

C Execution

1. Installation

    a. Install manual pull stations as indicated and connect to alarm circuit wiring. Coordinate mounting height with other devices, equipment and finishes.

    b. Install product of combustion and automatic alarm initiating devices as indicated and connect to alarm circuit wiring. Coordinate mounting and locations to manufacturers specifications and applicable codes.

    c. Install duct products of combustion detectors as indicated:

        1. Mount at a suitable location in the return air stream prior to exhausting from the building or being diluted by outside air.

        2. Mount at a suitable location in the supply air stream on the downside of the filters, and also downstream of the fan motor if the motor is enclosed in the air stream.

3. Mounted readily accessible for maintenance.

4. Locate each duct detector mounted near bends in the duct at least twice the duct width away from the bend.

d. Install audible signal devices as indicated and connect to signal circuit wiring. D.C. signal circuit wiring shall be suitable for Class II. Coordinate mounting and locations to manufacturers specifications and applicable codes.

e. Connect from the fire alarm system to the designated doors so that the operation of the fire alarm system shall release all doors equipped with electric hold-open door closers.

VOICE EVACUATION SYSTEM

f. Set speaker tap settings on transformers to give a SPL of 92 db at 1000 Hz at 10 feet.

g. All wiring to speakers shall be twisted pair, from the wire manufacturer, sized to carry the speaker load in each zone. Observe polarity to ensure all speakers are in phase.

h. All telephone wiring shall be twisted, shielded, jacketed pair when run with other wiring. Minimum wire gauge shall be No. 22 AWG.

i. Connect from the fire alarm system to the emergency generator(s) and fire pump(s) control panels to monitor operation.

j. All fire alarm wiring shall be in conduit. The contractor shall be responsible for the supply and installation of the conduit, wire, wire pulling, junction boxes, electrical boxes, and terminal cabinets in accordance with the manufacturers recommendations.

k. The manufacturer shall allow for the necessary amount of on site assistance for the contractor during the construction period.

l. Provide 10 complete sets of shop drawings for this specific project. Drawings to include POINT TO POINT wiring diagrams and equipment to be supplied. Drawings to be approved by the engineer before fabrication and supply of the equipment.

2. Verification and Certification

   a. The manufacturer shall make an inspection of the Life Safety equipment. The inspection shall include all equipment necessary for the direct operation of the system such as input and output devices.

   b. Verify wiring connections to all equipment meets applicable codes and standards.

   c. Verify equipment supplied by the manufacturer has been installed per the manufacturer's recommendations.

   d. Verify the operation of all devices.

   e. Verify the wiring to all supervised devices is supervised.

   f. The manufacturer shall supply reasonable amounts of technical assistance for any changes necessary to conform the work of this specification. During the period of inspection, the contractor shall make available electricians as required by the manufacturer.

   g. The manufacturer shall estimate the number of hours necessary to complete this inspection prior to closing of orders.

   h. The equipment supplier shall employ factory trained personel which are U.L. Certified for Fire Alarm service. Provide a copy of U.L. certificate as a page of the shop drawings.

   i. Provide a copy of the inspecting technician's report. Identify each device by location and certify the test results.

   j. The final inspection printout from the system printer shall be turned over to the engineer prior to turning the system over.

   k. Issue a UL Certificate for the FIRE ALARM SYSTEM After the completion of the certification.

   l. Include all costs of this inspection in the total selling price.

   m. Include a 1 year maintenance agreement in the system price which gives 4 quarterly inspections on the system. Agreement will be submitted in the manufacturers shop drawings.

2.33 EMERGENCY GENERATOR (Outdoor)

A. Furnish and install a complete and operating emergency power and lighting system as specified herein and as indicated on the Drawings.

B. The system shall be arranged to provide automatic and instantaneous emergency lighting upon failure of normal lighting in any of the supervised areas. This system shall meet all Code requirements for emergency lighting.

C. Furnish complete, install, and leave in good running condition, a 200 KW diesel fueled engine driven generating set continuously rated for standby service. The 200 KW rating shall be continuously available during any power outage. The unit shall be as hereinafter described ad as shown on the Drawings, complete with all controls, attachments, accessories, fuel and exhaust systems.

D. The unit shall be the product of a manufacturer regularly engaged in the production of this type of equipment as manufactured by Consolidated Power Ind., Caterpillar or Cummins.

E. The unit shall be capable of accepting the incoming loads of Automatic Transfer Switches. Shop Drawing Submittal for emergency generator shall include a signed statement from the manufacturer's representative stating that:

(1) manufacturer's representative has reviewed all loads to be connected to the emergency system,and

(2) the submitted emergency generator is capable of automatically starting and running the aforementioned loads.

F. OPERATION

1. The operation of this unit shall be automatic and upon the closing of a remote starting contact in Automatic Transfer Switch the engine shall start and attain rated voltage and frequency within ten (10) seconds.

2. All necessary accessories shall be provided to assure starting within the time described above under the ambient conditions decribed herein.

3. Furnish and install all electrical work and equipment required for the proper operation of this system. The General Contractor will provide the necessary roof structured supports for the emergency generator. The Electrical Subcontractor

shall provide weight information, as well as dimensional information of the generator to the General Contractor.

G. ENGINE

1. The engine shall be water-cooled, six cylinder, two cycle, industrial type, heavy duty diesel fueled, with a minimum displacement of 426 cubic inches, and a maximum rated output of at least 315 H.P. at a maximum R.P.M. of 1800. Ratings shall be for standard conditions of 29.92" barometer and 60 degrees air temperature.

2. Lubrication shall be a full pressure system using an engine driven gear-type lube oil pump with replaceable element full flow lube oil filter. Oil cooler shall be required.

3. Fuel System, Diesel

   a. The engine fuel system shall include all equipment normally supplied and recommended by the generator set manufacturer for standby generator service. The fuel engine system equipment shall incude (but not be limited to) the following:

      - fuel injection system
      - fuel line solenoid valve
      - flexible fuel connections

   b. In addition, there shall be a 500 gallon double wall base mounted fuel oil storage tank on all housed units.

   c. The system shall be mounted and piped in the enclosure supplied by the engine generator set supplier and shall include (but not be limited to) the following:

      - 500 gallon double wall base mounted tank
      - float switch
      - rupture basin with alarm

      Connection for:

      - Engine feed
      - Engine return
      - Main tank
      - Overflow
      - Vent
      - High fuel level alarm relay
      - Low fuel level alarm relay
      - 1/3 HP transfer pump, 120V

d. The fuel system shall be in compliance with all state and local codes.

4. Governor

a. The engine shall be equipped with a mechanical governor capable of maintaining the engine speed from no load to full load within 5% of the synchronous speed.

5. Starting System

a. The engine shall have a 12 V.D.C. starting system with one (1) starting motor and starter solenoid switch.

b. Batteries - One set of starting batteries with cables and steel battery rack, shall be included; batteries shall be heavy duty lead acid type, rated 220 ampere hours.

c. Float type battery charger shall be supplied to maintain the starting batteries at full charge. The charger shall be suitable for wall mounting (or may be mounted in the generator control panel) and shall have a cranking disconnect relay or current limiting feature. The charger shall be LaMarche. Battery charger shall be prewired to generator terminal strip prior to shipment. Battery charger shall include high and low battery voltage alarm relays for annunciator panel and be Model A18-3-12V or equal. Include high and low voltage alarm relay.

d. There shall be a belt drive battery charging alternator with regulator and charge rate ammeter for charging the batteries while the engine is running or the float type battery charger may be arranged to charge the batteries from the normal source when the engine is shut down and from the generator output when the generator is operating. This shall be accomplished by a relay energized from the generator output.

6. Jacket Water Heater

a. A 1500 watt engine jacket water heater shall be provided to maintain the engine jacket water at a temperature high enough to assure starting the engine and attaining rated voltage and frequency within ten (10) seconds. The jacket water heater shall be of the capacity recommended by the generator set manufacturer to meet the above conditions. Input voltage to the heater shall be 120-1-60.

7. Lubricating Oil Heater

   a. A 300 watt engine lubricating oil heater shall be provided with the same functions as jacket water heater.

8. Engine Cooling System

   a. The engine shall be equipped with a unit mounted radiator cooling system complete with unit mounted radiator, circulating water pump, by-pass thermostat, and radiator belt guards. The radiator shall be supplied to operate in an ambient temperature of 110 degrees F.

   b. The cooling system shall be filled with a 50% solution of ethylene glycol and water.

9. Safety Shutdown

   a. The engine shall be equipped with safety contacts for:

      - low jacket water temperature
      - low lube oil pressure
      - high jacket water temperature
      - overspeed
      - overcrank
      - high oil temperature

10. Engine Instruments

    a. The following engine instruments shall be included either in an engine instrument panel or in the generator control panel:

       - lube oil temperature
       - lube oil pressure
       - water temperature
       - D.C. ammeter

       Any other instruments considered necessary by the manufacturer shall be included.

11. Exhaust System

    a. A high degree exhaust silencer suitable for residential type silencing complete with condensate drains shall be supplied of the size recommended by the generator set manufacturer, but in no case less than 5 inches. Silencer shall be as manufactured by Kettell, Maxim, or

Burgess Manning. An octave band center frequently in Hertz data sheet shall accompany all Muffler Shop Drawings. A section of seamless, flexible stainless steel exhaust connection of the size and type recommended by the generator set manufacturer, but in no case less than 5 inches diameter and eighteen (18) inches long. If the engine is Vee type, a single exhaust outlet header shall be supplied.

12. Mounting

    a. The engine and generator shall be close coupled and mounted on a structural steel base designed to maintain proper alignment of the unit.

    b. The unit shall be certified by the manufacturer to be free from any critical torsional vibrations within a range of plus or minus 10% of synchronous speed.

    c. Vibration isolators of the rubber pad type shall be supplied with the unit. The number of isolators shall be as recommended by the generator set manufacturer.

    d. Vibration isolators shall be Korfun MMB Series or equal by Consolidated Kinetics or Vibration Eliminator.

H. GENERATOR

1. Rating - 200 KW, 250 KVA, 0-8 P.F., 3 phase, 60 cycle, 120/208 volts.

2. Type - Revolving field, 4 pole, single bearing, drip-proof.

3. Exciter - brushless, direct connected, fully tropicalized, SCR rectifiers, static voltage regulator, Rheostat, excellent motor starting capability.

4. Voltage Regulation - Plus or minus 1% of any preset value over the three (3) phase load range. Instantaneous voltage dip or rise when measured with an oscillioscope, will not exceed 20% upon full load application or rejection, and will return to preset value within 0.5 seconds.

5. Waveform - Deviation factor of output voltage will not exceed 5% and the value of any individual harmonic will not exceed 2% of the fundamental when oeprating with an unbalanced load.

6. Temperature Rise - Temperature rise of any component will not exceed the rise permitted by NEMA Standards.

7. Rotor - One (1) piece laminations welded and secured to shaft by a key and press fit. A mortisseur windings installed and connected between poles as an aid to parallel operation and improved wave form during unbalanced loads. Field coils machine would on insulated pole body and securely braced. Rotor statically and dynamically balanced.

8. Stator - One (1) piece laminations welded together. Stator coils form wound and placed in insulation slots. Stator pressed and welded in a rigid steel frame.

9. Bearing - Double sealed ball bearing, lubricated for life.

10. Insulation - NEMA Class F insulation.

11. Varnish - Three (3) coats modified polyester type, will not support fungus growth.

12. Cooling - Cast aluminum fan mounted on generator shaft.

13. Radio Suppression - Radiated or conducted radio interference will not affect normal commercial apparatus.

14. Controls

    a. (Unit Mounted) The engine generator set shall include a combination engine generator control panel shock mounted at the generator end of the

    unit. This unit mounted panel shall include (but not be limited to) the following:

    - water temperature gauge
    - oil pressure gauge
    - D.C. battery charge rate ammeter
    - A.C. voltage regulator
    - voltage adjusting rheostat
    - start-stop switch
    - A.C. voltmeter, 3 1/2" diameter, 2% accuracy
    - A.C. ammeter with current transformers, 3 1/2" diameter, 2% accuracy
    - combination VM-AM phase selector switch
    - frequency meter, 3 1/2" diameter
    - elapsed time meter, 3 1/2" diameter
    - automatic start-stop control with faulty indicating lights and corresponding safety switches for:

- low oil pressure (prewarn and shutdown)
- overcrank protection (manual reset)
- high water temperature (prewarn and shutdown)
- overspeed
- overcrank
- selector switch - "off, auto, manual" with light for "selector switch off"
- manual reset line circuit breakers, 3 pole, 400 amp frame, 300 amp trip, and a 300 amp frame, 1500 amp trip motor circuit protector Mounted in NEMA I enclosure with an interrupting capacity of 22,000 amps, sym, at 240 volts.

b. The control shall be designed to start the engine upon a closure of a remote contact, arm all safeties, and shutdown the engine when the remote contact is re-opened.

c. The control must be manually reset following any fault condition.

d. Control power shall be from the engine start battery.

I. DERANGEMENT PANEL

1. A flush remote mounted engine generator derangement panel shall be built, tested, and supplied by the generator supplier. The derangement panel shall monitor, visually and audibly, the following:

- Generating (visual only)
- High water temperture
- Low water temperature
- Low oil pressure
- High oil temperature
- Overspeed
- Overcrank
- Battery charger malfunction
- High fuel level - day tank
- Low fuel level - day tank
- Alarm silenced (visual only)
- Panel mounted alarm
- Alarm on/off switch

The derangement panel shall be located adjacent the fire alarm control panel.

J. WEATHERPROOF ENCLOSURE

1. A weatherproof enclosure shall be provided with all accessories specified herein, mounted, piped, and wired to terminal strips within the enclosure, except for automatic transfer swtiches. Motorized louvers shall be fused and prewired prior to

shipment. For incoming air, provide gravity operated louver for radiator exhaust.

2. The sheet metal enclosure shall have hinged panel doors and shall have fixed louvers and gasketed seams to insure weatherproof construction. The housing shall be painted per the manufacturer's recommendations. In addition to motorized louvers, there shall be fixed louvers to reduce snow loads on motorized louvers and gravity operated louvers. 14 gauge galvanized steel floor shall be included.

3. Silencer shall be mounted within the enclosure and the exhaust pipe shall terminate in a suitable "Shanty Cap".

4. Door handles shall be supplied with locking devices and duplicate keys.

5. Housing shall be painted ASA-61 gray enamel, two (2) coats minimum.

6. Housing shall contain duplex receptacle and overhead light, both powered from normal emergency source.

K. AUTOMATIC LOAD TRANSFER SWITCHES

1. Automatic transfer switch shall be furnished with full load current rating of 260 amperes, 120/208 volts, 3 phase, 4 wire, 60 hertz, A.C. normal and emergency. The transfer switch shall be capable of switching all classes of load, and shall be rated for continuous duty when installed in a non-ventilated enclosure that is constructed in accordance with Underwriter's Laboratories, Inc., Standard UL-1008.

2. The transfer switch shall be double throw, actuated by a single electrical operator momentarily energized; and connected to the transfer mechanism by a simple overcenter type linkage with a total transfer time not to exceed one-half (1/2) second. The transfer switch shall be capable of transferring successfully in either direction with 70% of rated voltage applied to the switch terminals.

3. The normal and emergency contacts shall be positively interlocked mechnically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets or springs; and shall be silver-tungsten alloy protected by arcing contacts, with magnetic blowouts on each pole.

4. The transfer switch shall be equipped with a manual operator that is designed to prevent injury to the operating personnel, if the electrical operator should suddenly become energized during manual transfer. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flash-over from switching the main contacts slowly.

5. Engine starting contacts shall be provided to start the generating plant, if any phase of the normal source drops below 70% of rated voltage, after an adjustable time delay period of three (3) to thirty (30) seconds, to allow for momentary dips. The transfer to emergency, as soon as the voltage and frequency have reached 90% of rated voltage. After restoration of normal power on all phase to 90% of rated voltage, an adjustable time delay period of of 0-30 minutes shall delay re-transfer to normal power, until it has had time to stabilize. If the emergency power source should fail during the time period, thetime delay shall be by-passed, and the switch shall return immediately to the normal source. After the switch has retransferred to normal, the engine generator shall be allowed to operate at no load for an adjustable period of time (0-5 minutes) to allow it to cool before shut down. The transfer switch shall include a test switch to simulate normal power failure, pilot lights on the cabinet door to indicate the switch closed on normal or emergency and four (4) auxiliary contacts on the main shaft; two (2) closed on normal, the other two (2) closed on emergency. The transfer switch shall also be provided with pre-elevator signal contacts.

6. Load transfer switches shall be as manufactured by Westinghouse or Kohler.

L. TEST

1. The supplier of the equipment shall provide with no additional charge, any information or supervision required for the proper installation of the equipment. Upon completion of the installation of this unit a test run for four hours shall be conducted by the equipment manufacturer's factory trained serviceman, utilizing load banks to attain full generator rating. At this time adjustments shall be made for correct operation of the equipment and the following readings taken at 15 minute intervals:

   - Engine jacket water temperature
   - Generator temperature

- Oil pressure
- Battery charge rate
- A.C. volts
- A.C. amps (all legs)
- Engine air exhaust temperature
- Engine oil temperature

2. The second test shall be made by utilizing available connected load. The supplier of this equipment shall also furnish and install lube oil in the engine and also drain and refill the engine with new lube oil after the engine-generator test has been completed. If the engine-generator test has been completed. If the engine-generator unit should fail this initial test run, as determined by the representative of the Owner, after proper corrective measures have been implemented, replace engine lube oil again after the second test. If any additional tests are required to prove the performance of the engine-generator unit, lube oil shall be replaced after each such test run.

3. Prior to shipment of generator to the job site, conduct 3 hour full load shop test utilizing resistive load to attain full rated load. A written report of this test shall be forwarded to the Engineer for approval prior to shipment. All expenses for these tests shall be carried by the Electrical Subcontractor. Notify Engineer one (1) week prior to shop test. Shop test may be witnessed.

2.34 APARTMENT HOUSE INTERCOM SYSTEM

A. Furnish and install an apartment House Electronic Internal Communications System in each building as shown on the plans as distributed by Signet Electronics Sysstems, Inc. 617-871-5888.

B. Operation of any pushbutton on the vestibule entrance panel by the caller shall sound the signal on the corresponding suitephone. The tenant, by using the combination talk/listen button, may converse with the caller and thus identify the person calling. Only after determining the identity of the caller, the tenant may release the security door by depressing the door release button on the suitephone. The system in general shall consist of signalling the common voice communications from each vestibule to all apartments.

C. The pan3el shall consist of as many call buttons as areas to be called, speaker microphone and appropriate index panel. The unit complete with exterior frame sha ll be housed in an appropriate metallic flush mounted backbox. The panel shall be built in two sections. One section shall include numbered signalpushbuttons with a speaker in the center, Model ACS-9. the other section shall include a metal framed glass panel, including an index board bearing rows of plates for printed names and numbers, Model ACS-23. The speaker panel shall contain provisions for Postal Lock Release. Entrance panel to be finished in brushed stainless steel. The unit shall be weatherproof and vandalproof, supplied with tamperproof hardware and tool.

D. The cordless suitephones shall have the following components. Pushbutton switches (one for door release, one for talk and one for listen). The buttons shall be spring loaded plastic self-wiping switch. The loud speaker shall be 2-1/2" magnet, .55 oz. The electronic tone shallbe adjustable at amplifier. The units shall be brushed stainless steel and mount on a two gang plaster ring. All lettering shall be engraved and stencilled in. Suitephone units shall be Model ACS-17P. Handicapped units will be furnished with a red light which will glow when the tenant is called.

E. The power supply shall operate from a 120 volt A>C> power source. Sexteen (16) volts A>C> output for talking. Unit shall be fully transistorized. Model number ACS-PS.

F. The amplifier shall be fully transistorized. The unit shall contain a volume control, to enable the output to be set and locked to suit the desired operational level of the station, and installed in rear of entrance panel, to enable the ease of adjustment and to prevent accidental volume increase. The amplifier shall be Model ACS-30 and contain provisions for the postal release. Multiple kentries shall have additional transfer unit where more than one entry leads to the same apartment or group of apartments, modelnumber FMC26 or equal.

G. The door opener shall be mortise type and shall replace the lock strike plate in the frame of the door. Door opener compatible with door shall be supplied under Finish Hardware section of these specifications.

H. Wiring:

1. All wiring shall be as shown on the plans and installed in strict accordance with the National Electrical Code, Massachusetts Electrical Code, and applicabel state and local regulations.
2. This Contractor shall obtain wiring diagrams from the successful manufacturer prior to roughing in his conduit or coring floors for cable passage, and

shall interconnect all grounds and shorts. Wiring shall be installed in rigid steel raceways where exposed and subject to mechanical or physical damage.

2.35 EMERGENCY CALL SYSTEM

A. Provide and install an Emergency Call System as manufactured by Sesco, Inc. Devices shall be mounted as indicated and as shown on the Plans.

B. An emergency pull cord shall be located in the bedroom and bathroom of each apartment and as indicated on the Plans. The act of pulling the Emergency Pull Cord shall cause the following to happen:

1. Activate the flush interior corridor bell, common to the apartment floor zone.

2. Sound a buzzer and illuminate a light corrresponding to the particular apartment on an annunciator panel located beside the elevator as shown on the Plans.

3. Sound a buzzer and illuminate a light corresponding to the particular floor on an annunciator panel located in the main lobby as shown on the Plans.

4. Sound a buzzer and illuminate a light at the duty station located in the office and as shown on the Plans.

5. The system will continue to operate as specified until the specific room station has been returned to normal.

C. Emergency Call Station shall be Signet Model SF117/4. The Emergency Call station shall contain DPDT switch with emergency locking lever action. The toggle switch shall be constructed of precioys metal contacts. The paddle type lever on the switch shall be of steel construction and contain a 1/8"hole for receiving nylon pullcord. The switch shall mount on a single gang stainless steel faceplate with the word 'EMERGENCY' permanently engraved and red filled. The bottom screw of the plate shall be an eye screw which shall act as a call cord guide. Unit shall be supplied with 6' durable nylon cord with a pendant for easy gripping and pulling.

D. Signals shall be Signet Model 1443 6" 24 volt AC vibrating bell. It shall be standard sound clear ringing bell free from mechanical clatter. Bell shall have a shock proof Zamak die cast housing and have dust proof fully enclosed mechanism. The unit shall be flush mount in metal enclosure with standard 13 x 13 grill cover. Exterior bells shall mount to a "WBB" weatherproof backbox with threaded conduit hubs.

E. Power supply shall be Signet Model 88-50 -50 watt U.L. listed surface mounted transformer, 120 volt. (Furnish one).

F. Signet Model LI001AN dome light. Plastic dome shall permanently be fixed to plate with four stainless steel screws and mount on single gang box.

G. All wiring shall be as shown on the Plans and installed in strict accordance with the National Electrical Code and applicable state and local regulations.

H. The Contractor shall guarantee all equipment against any and all electrical or mechanical defects for one full year from date of completed installation.

I. The Architect through the Engineer shal be supplied with eleven copies of illustraitons, specifications, descriptions, engineering data sheets of the equipment to be supplied for approval prior to commencement of any specified work.

J. The Contractor shall provide all necessary information for proper efficiency.

1. Diagrams and engineering data sheets of the equipment.
2. Necessary information for proper installation, operation, and service maintenance.
3. Two maintenance manuals shall be supplied to the Owner upon completion of the installation.

2.36 INTRUSION ALARM SYSTEM

A. Provide and install an Intrusion Alarm System as manufactured by Aritech Moose, Inc. Devices shall be mounted as indicated and as shown on the Plans.

B. Door contacts shall be provided at each unit entry door on the ground level.

C. Motion detectors shall be provided in the unit as indicated on the plans.

D. Activation of the system shall;

1. Activate the interior electric siren, common to the apartment.
2. Illuminate a light corrresponding to the particular apartment zone on the control panel.

3. The system will continue to operate as specified until the specific room station has been returned to normal and the system reset.

E. Door contacts shall be concealed reed switch type, 3/4" in diameter, Ultrack # 75, or equivalent - OR - door hinge push button, Ademco # 116.

F. All doors leading to the exterior shall use 22/2 AWG or 18/2 stranded wire. Home runs to the main control panel located in the laundry room or under stair closet of each unit.

G. Digital keypads shall be 4/22 solid AWG wire, located at the nearest exit/entry door to the control panel.

H. Motion detectors shall be flush mounted Visonic Model MR-4600

I. Interior electronic sirens shall be Moose MPI 36.

J. Control panels shall be a 6 zone type with central station monitoring capabilities and rechargeable batteries. Moose model # Z900R or approved equal.

K. All wiring shall be as shown on the Plans and installed in strict accordance with the National Electrical Code and applicable state and local regulations.

L. The Contractor shall guarantee all equipment against any and all electrical or mechanical defects for one full year from date of completed installation.

M. The Architect through the Engineer shal be supplied with eleven copies of illustraitons, specifications, descriptions, engineering data sheets of the equipment to be supplied for approval prior to commencement of any specified work.

N. The Contractor shall provide all necessary information for proper efficiency.

   1. Diagrams and engineering data sheets of the equipment.

   2. Necessary information for proper installation, operation, and service maintenance.

   3. Two maintenance manuals shall be supplied to the Owner upon completion of the installation.

2.37 LIGHTNING PROTECTION SYSTEM

1. GENERAL

A system of lighting protection shall be provided and installed in compliance with the provisions of the latest "Code for Protection Against Lightning" for buildings as adopted by the National Fire Protection Association and the Underwriters' Laboratories, Inc. for a Master Label System.

If any departures from the contract documents are deemed necessary by the contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable to the Architect for approval. No such departures shall be made without the prior written approval of the contracting officer and the Architect. Also, the lightning protection system shall be installed by a lightning protection contractor who specializes in this field.

2. MATERIALS

The lightning protection equipment shall be manufactured by Heary Bros. Lightning Protection Co., Inc. of Moore Road, Sprinville, New York, 14141 or equal to. All materials shall comply in weight, size and composition with the requirements of the Underwriters' Laboratories, Inc. and the National Fire Protection Association Code relating to this type of structure.

3. AIR TERMINALS

Air terminals shall be 3/8" x 18" solid copper and shall extend at least 18 inches above the object to be protected. All air terminal bases shall be case copper with stainless steel bolt-pressure cable connectors. The air terminals should be spaced so as not to exceed 20' apart around the outside perimeter of the roof or the ridge and not over 50 square feet apart through the center of flat roof areas. The air terminals in the center roof area shall be 3/8" x 48" solid copper with a proper brace. All air terminal bases for flat roof areas shall be of the adhesive type.

4. CONDUCTORS

Conductors shall consist of U>L> listed 32 gauge copper wire weighing 215 lbs. per 1000 feet and installed in accordance with the UL Code. A perimeter cable shall be installed around the entire main roof, and all penthouses and cooling towers. Each perimeter cable shall be connected to at least (2) down leads, providing a two way path to ground from each air terminal. All center roof air terminals shall be interconnected with conductors to the outside perimeter cable. Conductors on the flat roof areas may be run exposed. Ground connections shall be made around the perimeter of each roof and to the main down conductor at a maximum of 100'-0" on centers

5. CONCEALED CONDUCTORS

All concealed conductors shall be installed in schedule 40 1" P.V.C. Conduit to be furnished and installed by the Electrical Contractor.

6. FASTENERS

Conductor fasteners shall be an approved type of non-corrosive metal, have ample strength to support conductors and shall be spaced not to exceed 3-0" centers. Masonry type cable fasteners spaced every 3-0" on masonry. Adhesive type cable fasteners spaced every 3-0" on flat roofs.

7. ROOF PENETRATION

Wherever the conduit penetrates the roof, copper pitch pans shall be furnished by the lightning protection contractor and installed by the roofing contractor. Wood nailing blocks shall be furnished and installed by the general contractor. All patching and masonry work shall be furnished and installed by the general contractor.

8. DOWN CONDUCTORS

Buildings that are of reinforce concrete or wall bearing structures, the concealed down conductors shall be installed in schedule 40 1" P.V.C. conduit. Each perimeter roof cable shall be connected to at least 2 down leads. The average distance between down leads shall not exceed 100 feet from upper roof to lower roof, or from roof to ground terminals irregularly shaped structures may require extra down conductors to provide a two way path to ground from each air terminal.

9. CABLE CONNECTORS

All cable connectors shall be cast copper with screw-pressure type stainless steel bolts and nuts.

10. INTERCONNECTION OF METALS

All metal bodies within 6' of the conductor shall be bonded to the system with approved fittings and conductor connections between dissimilar metals shall be made with approved bimetallic connections.

A. Bonding of all metallic objects and systems at roof levels and elsewhere on the structure shall be complete. Primary bonds for metal bodies of conductance shall be bonded with appropriate fittings and full size conductor; and shall consist of, but not limited to the following: Roof exhaust fans, HVAC units with related piping ductwork, exhaust vents and any other roof piping systems, cooling towers and rails systems, window washing tracks, antenna mast for T>V>, radio or microwave, flag poles, roof handrails and/or decorative screens, roof ladders, skylights, metal plumbing stacks, etc. Exterior architectural metal fascia and/or curtain walls or mullions, which extend the full height of the structure shall also be bonded, if not inherently bonded thru the building frame.

B. Metal bodies of inductance located within six feet of a conductor or object with secondary bonds, shall be bonded with secondary cable and fittings. Typical of these are: roof flashings, parapet coping caps, gravel guards, isolated metal building panels or siding roof drains, down spouts, roof insulation vents and any other sizable miscellaneous metals, etc.

11. GROUNDING

Grounding terminals shall be located at the base of the structure. Ground connections shall be made around the perimeter of the structure and in no case shall average over 100'-0" apart. Ground terminals shall be 3/4" in diameter and shall be driven to a minimum depth of 10' and more if necessary to reach permanent moisture. One ground shall have connection to the water system where the water supply enters the building, in addition to artificial ground. In case of rock ledge or other conditions making it impossible to comply with the above trenching or a copper ground plate will be permitted:providing it will meet the Underwriters' Laboratories Inc. requirements (See No. 8 Down Conductors).

12. COMMON GROUNDING

Provide necessary common grounds between the lightning protections system and the electric and telephone service entrance wires, TV and radio antenna grounds.

13. SURGE ARRESTOR

Surge arrestors on electric service shall be supplied and installed by electrical contractor.

14. EXISTING BUILDINGS

Existing buildings adjacent to new structures that are 20 feet or more in height and extending from structure 30 feet or more, shall be equipped with a lightning protection system in order to issue an Underwriters Laboratories Master Label on these structures.

15. EXCAVATING

All services involving excavating, trenches, back filling, tamping of ground for ground rods, test wells, and ground loops shall be furnished and completed by the general contractor or excavating contractor and meet the Architects and Engineers requirements. All labor used for excavating in this area shall meet with local labor agreements.

16. APPROVALS

Underwriters Laboratories, Inc. Master Label shall be furnished as evidence that the installation has met with UL 96A code requirements. Shop Drawings in detail and catalog cuts shall be submitted for approval by the Architect and Engineer proper to installation of the system.

PART 3.00 - EXECUTION

3.01 MATERIAL AND WORKMANSHIP

A. All locations subject to review by the Architect in order to coordinate with field conditions.

3.02 TESTS

A. The right is reserved to conduct acceptance tests of all equipment wiring or any other work furnished under these Drawings and/or Specifications to determine the fulfillment of specific requirements and/or design.

B. The Electrical Contractor shall conduct all such tests in the presence of authorized representative of the Owner and at such times that the Owner may designate.

C. The Contractor shall perform all tests, supply all instrumentation, personnel and make all adjustments of equipment and wiring as may be necessary. Insulation resistance readings of all equipment and circuits shall be taken by the Contractor in the presence of the Owner's representative. Megger readings of less resistance than the recommended minimum as called by Section 110-7 of the NEC shall be required or replaced by this Contractor at no cost to the Owner.

3.03 GROUNDING

A. The Contractor shall furnish and install all material required for a grounding and/or bonding in the building of fall equipment, power systems, all as shown on the Drawings and/or specified, as a minimum.

B. Grounding shall conform to NEC Article 250.

3.04 INSTALLATION OF WIRING AND CONDUIT

A. In general, all wiring is to be run concealed unless otherwise indicated to be run exposed. Exposed wiring in the basement is not acceptable.

B. Raceways shall be continuous from outlet to outlet and from outlets to cabinets, junction and pull boxes, and shall enter and be secured to all boxes in such manner that each system shall be electrically continuous from service to all outlets. Terminal of all conduits shall be furnished with double locknuts and bushings.

C. Exposed conduits shall be run parallel to or at right angles to the wall of the buildings, and all bends shall be made with standard ells or bent to not less that the same radius. Horizontal runs of exposed conduits shall be close to ceilings, passing over water or other piping where possible and shall be supported by pipe straps or by other approved means, not more than five feet apart.

D. In no place shall a conduit be run within six inches of hot water pipes or appliances, except where crossing is unavoidable, and inthat case the conduit shall be kept as least one inch from covering of pipe crossed.

E. Conduits shall be supported on approved types of galvanized wall brackets, ceiling trapeze, strap hangers or pipe straps, secured by means of toggle bolts on hollow masonry, machine screws on metal surfaces or wood screws on wood construction. No nails shall be used as a means of fastening boxes or conduit.

F. In general, no splices or joints will be permitted in feeder cables, and branches shall be spliced at outlets or accessible junction boxes.

G. All splices in wire #6 AWG and smaller shall be standard pig-tail made mechanically tight, then cleaned, and insulated with proper layers and thicknesses or rubber and friction tape. Wire splicing nuts, Thomas and Betts, Sta-Kon or Minnesota Mining and Manufacturing Co., Scotchlock Type R, may be used subject to approval of the local inspector. Joints, tape, and splices in wire #6 AWG and larger shall be taped with approved rubber and friction tapes providing insulation not less than that of the conductor over Brundy Servits or equivalent connectors made by Penn Union or Blackburn.

H. Wire #6 AWG and larger shall be connected to panels and apparatus by means of approved lugs and connectors. Connectors shall be solderless type, sufficiently large to enclose all strands of the conductor and securely fastened.

I. Wiring method shall conform to local wiring inspector. Prior to submitting bid, Contractor shall confirm wiring method to be allowed by local ordinances.

3.05 INSTALLATION OF OUTLET BOXES

A. Outlet boxes shall be of size and type to accommodate structural conditions; size and number of raceways; conductors or cables entering; and device or fixture for which required.

B. Install blank plates on all outlet boxes in which no apparatus is installed, which do not integrally provide a cover for box.

C. Special care should be taken to set all boxes correctly, square and true with the building finish.

The edge of the box shall come flush with the building finish. As far as possible, all wall and switch outlets shall be erected in advance of furring and fireproofing and shall be secured to the building structure or steel by adjustable strap iron supports, which shall be buried.

D. The exact location of all outlets and switches in finished rooms shall be obtained from the Architect and from the scale drawings of interior details and finish. Final correct readjustment shall be made to outlets, if necessary, to give proper centering.

E. The locations given or designated on the Plans for the outlets are subject to modifications. In the case of local wall switches to be set at or near doors, the definite location shall be as established on the side of the door opposite the hinge.

3.06 JUNCTION AND PULL BOXES

A. Junction and pull boxes shall be furnished and installed under this Section of the Specification where indicated on the Drawings and wherever else such a box may be deemed necessary to facilitate the pulling or splicing of wire and cable.

B. All such boxes must be made accessible and shall be built only from the approved detail working Drawings. Conduits shall enter these boxes through tight-fitting clearance holes.

C. The covers of the boxes shall be designed for quick removal. Where junction boxes are required for a splicing box for special recessed fixtures, consult the Architect before installing boxes for these fixtures and determine the exact location of the boxes.

D. Each feeder passing through a pull box shall meet the approval of the Architect. Generally, junction boxes and pull boxes shall not be exposed in finished areas; where necessary, reroute conduits or make other arrangements to meet the approval of the Architect.

E. Outlet, pull, and junction boxes shall be properly sealed during the course of construction to prevent the entrance of dirt and foreign materials within same or the raceway system of which it is a part. The Electrical Contractor shall provide temporary covers for all open boxes. Paper may be solidly packed into standard work boxes to prevent the entrance of dirt and foreign materials, in lieu of cover plates if so elected by the Electrical Contractor.

3.07 LIGHT SWITCHES

A. In general, convenience outlet circuits shall be independent of light circuits. In all cases the light switches shall be located opposite hinge side of door, per latest Architectural Drawings.

3.08 GENERAL PANEL INFORMATION

A. All panels shall be properly balanced, the circuit numbers on the Plans being a numerical indication rather than any attempt to indicate proper balance.

B. Care shall be taken in the use of a common neutral to make certain that no more than one leg is taken from each phase.

C. Typed indexes shall be provided in each panel indicating circuit number and the outlets or items controlled or fed from same.

3.09 MOTOR WIRING

A. The Contractor shall do all wiring required for plumbing, ventilating, and heating motors including mounting of switches and starters, as well as wiring of same. All wiring for the control of motors, unless indicated on Electrical Plans, shall be indicated in HVAC,Plumbing and Fire Protection Sections.

B. The Contractor shall furnish and install starters and fused disconnecting means as required by the National Electrical Code for all motors. Motor-driven equipment specified under "Plumbing" and "Heating and Ventilating" may be factory wired complete with controller and motor disconnects; therefore, the Contractor should check equipment purchased under these divisions so as to avoid duplication of protective and disconnecting means. Motor disconnects shall be fused unless noted otherwise. Single phase disconnects may be thermal switches.

C. The Contractor shall furnish and install a fused disconnect at each heat pump and compressor motor. Fusing shall be per manufacturer's recommendation. Prior to wiring heat pumps, Contractor shall review submittals on heat pumps for electrical characteristics.

3.10 TELEPHONE SYSTEM SLEEVES

A. Contractor shall furnish and install a 4' x 8' x 3/4" plywood backboard for telephone equipment at telephone service entrance.

B. Contractor shall furnish and install sleeves from basement to each floor space, exact location shall be determined in field and as shown on the Plans.

3.11 M.A.T.V. SYSTEM

A. All fittings, pads, termiantions, filters, traps, etc. needed to provide the best performance possible will be considered required. All data sheets for such shall be shown in the submittal.

B. On completion of the installation of the system, the Contractor supplying this equipment shall provide a qualified technician with a calibrated field strength meter and a television receiver to show the quality of reception and verify signal strengths to the satisfaction of the Engineer and/or his authorized agent.

3.12 FIRE ALARM SYSTEM

A. INSTALLATION

1. Fire alarm system shall be wired in accordance with manufacturer's complete Wiring Diagram as submitted with Shop Drawings.
2. Limited energy cable shall be utilized for wiring system components, unless prohibited by local ordinances.
3. Provide two complete Wiring Diagrams and maintenance manuals to be turned over to Owner. Provide one additional Wiring Diagram and maintenance manual in control panel.
4. Entire system shall be guaranteed for one year after final acceptance.
5. Provide and install the system in accordance with the Plans and Specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760 A and C, Power-Limited Fire Protective Signalling Circuits or if required, may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the Contractor shall so certify in writing to the Owner and General Contractor.

   All junction boxes shall be sprayed red and labelled "Fire Alarm". Wiring color code shall be maintained throughout the installation.

6. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate Subcontractors.

7. The Contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

8. The manufacturer's authorized representative shall provide onsite supervision of installation.

B. TESTING

1. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the Contractor in the presence of the Owner's Representative and the Local Fire Marshall. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner and General Contractor.

C. WARRANTY

1. The Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one year from the date of the completed and certified test or from the date of first beneficial use.

2. The equipment manufacturer shall make available to the Onwer a maintenance contract proposal to provide a minimum of two inspections and tests per year in compliance with NFPA-72H guidelines.

D. GENERAL

1. The work covered by this Section of the Specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the Drawings and as herein specified.

2. The requirements of the conditions of the Contract, Supplementary Conditions and General Requirements, apply to the work specified in this Section.

3. The complee installation shall conform to the applicable sections of NFPA-72 (A), (B), (C), (D), (E), (F), Local Code Requirements and National Electrical Code with particular attetion to Article 760.

4. The work covered by this Section of the Specifications shall be coordinated with the related work as specified elsewhere under the project Specifications.

E. QUALITY ASSURANCE

1. Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.

2. In addition to the UL-UOJZ requirement mentioned above, the system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits must be marked in accordance with NEC Article 760-23.

3.13 FIRE ALARM INSPECTION AND TESTING CONTRACT

A. Prior to making the final connections to the Municipal Alarm System, a Contract must be in evidence between the person holding title to the interior fire alarm system and the holder of a certificate of competency as a Fire Alarm Systems Contractor from the Local Fire Department, who will be responsible for the inspection, testing, and maintenance of the interior fire alarm system and the Master Fire Alarm Box.

B. Each manual station or transmitter shall be tested at least twice a year. During bi-monthly test of each system at least one alarm initiating device shall be tested in each alarm circuit. A report of each month's test shall be forwarded to the Superintendent of Fire Alarm, Local Fire Department.

C. All detectors associated with an interior fire alarm system shall be tested once every twenty-four (24) months, with one-twelfth the number being tested in each monthly test.

D. Self-restoring detectors shall be exposed either to heat or smoke to test their ability to initiate an alarm.

E. Fusible link type detectors shall be unscreweed from their holders to test their ability to initiate an alarm. Every six months one (1) fusible link shall be exposed to heat to test the ability of the fusible link to respond to heat.

F. Bi-monthly test reports shall include the following information:

1. Date of Test
2. Name and location being tested
3. Master Fire Alarm Box number
4. Number of interior alarm circuits
5. Number of devices tested and type
6. Condition of emergency standby power supply
7. Name of company conducting test
8. Name and signature of person conducting test

G. The testing agreement will not cover:

1. Damage resulting from accidents, fire, storm, water, negligence, misuse, vandalism, defective or improper wiring.

2. Testing of waterflow switches on sprinkler system (waterflow switches to be tested by sprinkler company personnel).

3. Testing or repairs of door release mechanisms covered in another section of the hardware contract.

4. Testing or repairs of dampers, smoke hatches, elevator controls, or other peripheral equipment nor furnished by the fire alarm manufacturer.

H. The Electrical Contractor shall furnish and install in accordance with manufacturer's instructions all wiring, conduit, and outlet boxes required for the erection of a complete system as described herein and as indicated on the Drawings.

I. All wiring shall be in conduit and of the same approved type as used for electrical light and power wiring, and shall meet the requirements of all National, State, and Local Electrical Codes. The sizes of the different wires shall be as specified by the manufacturer. Color code shall be used throughout. All wires shall be tagged at all junction points and shall test free from grounds or crosses between the conductors.

J. Final connections between the control equipment and wiring system shall be made under direct supervision of a representative of the manufacturer.

3.14 QUIET OPERATION

A. All equipment and material furnished by this Contractor shall operate under all conditions of load without objectionable noise or vibration, which in the opinion of the Architect, is objectionable. Where sound or vibration conditions occur, which are considered objectionable by the Architect, this Contractor shall eliminate same in a manner approved by the Architect.

3.15 RECORD DRAWINGS

A. A set of as-built Record Drawings, consisting of a reproducible set of Architect's Drawings with additional sketches as required, denoting and dimensioning accurately all changes in elevation location, and size of material deviating from the Architect's Drawings, shall be kept concurrently with the progress of the installation. Upon completion of the work, the Contractor shall deliver to the Architect an up-to-date set of these as-built Record Drawings.

3.16 SUPPLEMENTARY STEEL, CHANNELS, AND SUPPORTS

A. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Architect prior to the installation of same. The Electrical Contractor shall submit to the Architect, via the General Contractor the location where he proposes to use supplementary steel, and channels, for the support of equipment, fixtures, and raceways. The submittal shall indicate the mounting methods, size, and details of the supports, channels, and steel. It shall indicate also the weight which the supports, channels, and supplementary steel are to carry.

3.17 EMERGENCY GENERATOR

A. The Electrical Contractor shall install the Emergency Generator in accordance with the manufacturer's directions.

B. The Electrical Contractor shall field verify all clearances, dimensions, and weights.

3.18 EMERGENCY BATTERIES AND REMOTE HEADS

A. Battery units and remote heads shall be installed where located on the Plans. Contractor must coordinate exact locations in field with respect to door swings, mounting heights, and latest Architectural Plans.

B. Battery units shall be provided with proper terminal strips, fusing for 12V circuits and shelf or wall mount brackets.

C. Remote heads shall be wired as indicated on Plans. Wire sizes specified shall provide for a less than 5% voltage drop.

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